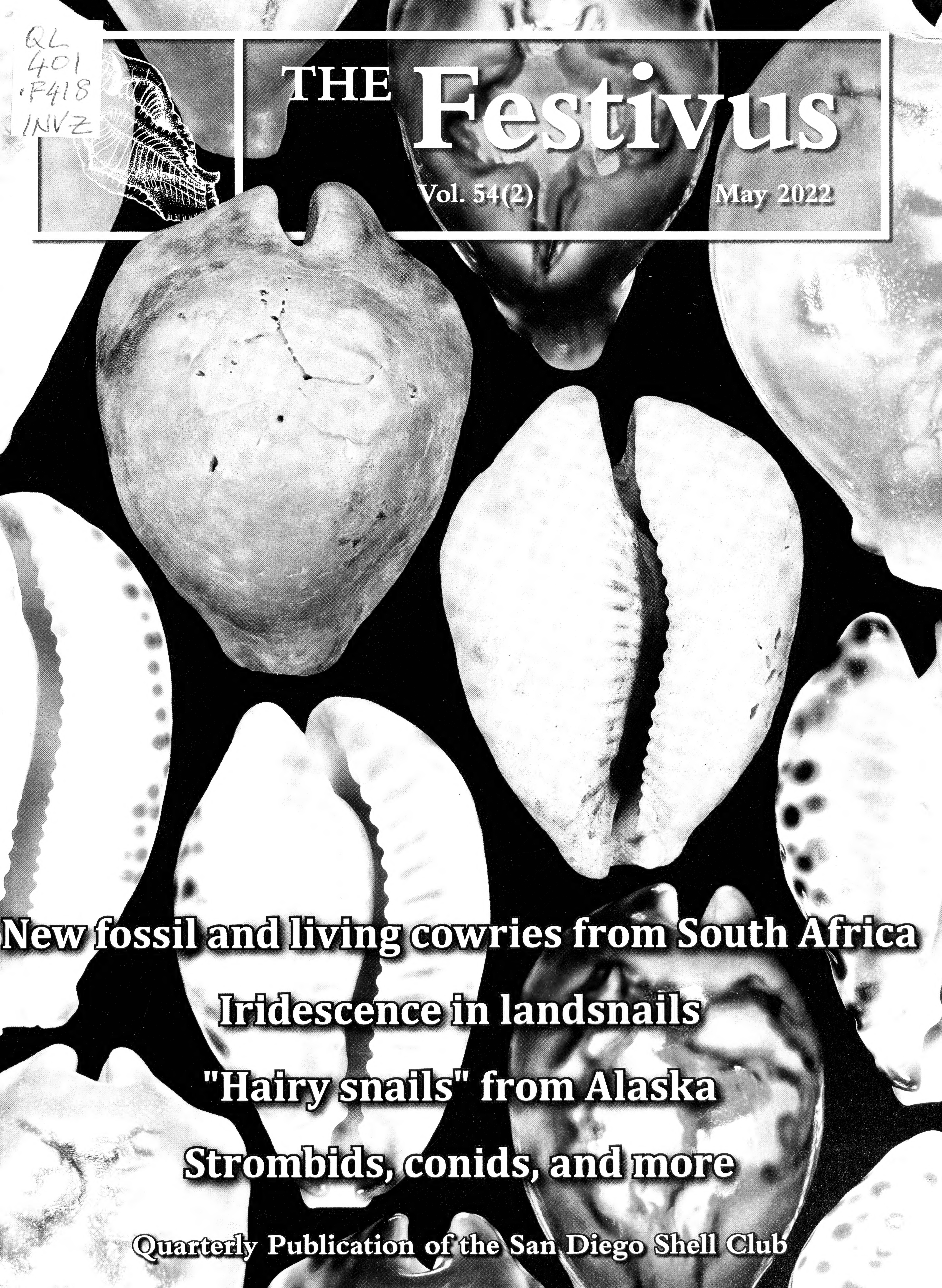

THE Festivus

Vol. 54(2) May 2022

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Quarterly Publication of the San Diego Shell Club

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THE FESTIVUS

A publication of the San Diego Shell Club

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Barycypraea iungo Seccombe & Aiken, 2022, *Barycypraea fultoni fultoni, Barycypraea fultoni fultoni* [*miniatra*], *Barycypraea fultoni amorimi*, and *Barycypraea fultoni amorimi* [*mozambicana*]. (Photos courtesy of Roy Aiken) (Cover artistic credit: Rex Stilwill).

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Description of *Phasmoconus (Phasmoconus) nemo* n. sp. (Gastropoda: Conidae) from south-eastern Africa

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ABSTRACT A study of the *Phasmoconus* species of southern Mozambique and northern KwaZulu-Natal, South Africa revealed a new species within an already complicated group of species. A total of 83 adult specimens were studied, measured and analyzed. The study revealed two main forms of *Phasmoconus* (*Phasmoconus*) *chindeensis* Monnier, Prugnaud & Limpalaër, 2021 and a new species, described here as *P.* (*P.*) *nemo* n. sp. The two forms of *P.* (*P.*) *chindeensis* have too few different characteristics to separate them as different species. *Phasmoconus* (*P.*) *nemo* n. sp. is different from the rest having a more rounded shell morphological feature, high spire with a slightly convex shape, broad shoulder in relation to shell length. The aperture is narrow at the posterior side, slightly bend, and flaring out at the anterior sinus. The spiral grooves of the different species are discussed and the differences highlighted.

KEYWORDS Conidae, *Phasmoconus*, *chindeensis, nemo,* northern KwaZulu-Natal, South Africa, Mozambique

INTRODUCTION

A small group of cones, sometimes referred to as the "*inscriptus* complex", was recently revised by Monnier *et al.* (2021). This "complex" of cones, classified under the genus *Phasmoconus,* mainly comprises of the following Indo-Pacific species: *Phasmoconus* (*Phasmoconus*) *inscriptus inscriptus* (Reeve, 1843), *P.* (*P.*) *inscriptus cuneiformis* (E.A. Smith, 1877) and *P.* (*P.*) *inscriptus keatiformis* (Shikama & Oishi, 1977) from India, *P.* (*P.*) *maculospira* (Pilsbry & Johnson in Pilsbry, 1922) from the Gulf of Bengal to Thailand, *P. (P.) adenensis* (E.A. Smith, 1891), *P.* (*P.*) *salzmanni* (G. Raybaudi Massilia & Rolan, 1997), and *P.* (*P.*) *yemenensis* (Bondarev, 1997) from Yemen and Somalia, and the recently described species *P.* (*P.*) *chindeensis* Monnier, Prugnaud & Limpalaër, 2021 from Mozambique and northern KwaZulu-Natal, South Africa.

The author studied specifically the south-eastern African (Figure 1) *Phasmoconus* shells for many years, splitting the shells into three probable groups, ignorantly in the past identified the shells under the names *Conus inscriptus inscriptus, C. insriptus adenensis,* and *C. inscriptus keatii,* until Monnier *et al.* (2018, 2021) shed some light on the subject. Monnier *et al.* (2021) established that *P.* (*P.*) *adenensis* is a moderately large, slender shell, with a short spire (Figures 14.6 & 17.3), only from the coast off Yemen and Somalia, and not south-eastern Africa. *Phasmoconus* (*P.*) *keatii* is according to Monnier *et al.* (2021) from the West Indian Ocean, and is poorly understood, with apparent specimens recorded off Yemen. Monnier *et al.* (2018) assigned *P.* (*P.*) *inscriptus* to shells from southern Red Sea and the Peninsular India, shells that are moderately large to large with a very broad shoulder and a low spire. *Phasmoconus* (*P.*) *inscriptus inscriptus* has full developed pattern across the body whorl

(Figures 14.3, 17.1 & 17.2), *P.* (*P.*) *inscriptus keatiformis* has darker but lesser pattern (Figures 14.4, 17.6 & 17.7), whereas *P.* (*P.*) *inscriptus cuneiformis* has very faint to no pattern visible (Figures 14.7, 17.4 & 17.5).

The one "form" in the author's collection is now identified as the newly described species, *P.* (*P.*) *chindeensis*, a medium to large, conical shell (Figures 2, 14.2, 16.1, 16.2, 16.3 & 16.6). The spire is moderately high with a concave outline, the apex is off-white. The profile of the last whorl is relatively straight, slightly convex. After studying the whole group, two more "forms" are still identified as before by the author. The second "form" has most of the main characteristics as *P.* (*P.*) *chindeensis* (Figures 14.5, 16.4, 16.5, 16.7 & 16.8), with several minor shell morphological differences, discussed below. The third show significant differences that led to the description of the new species, *P.* (*P.*) *nemo* n. sp. (Figures 3, 14.1 & 15).

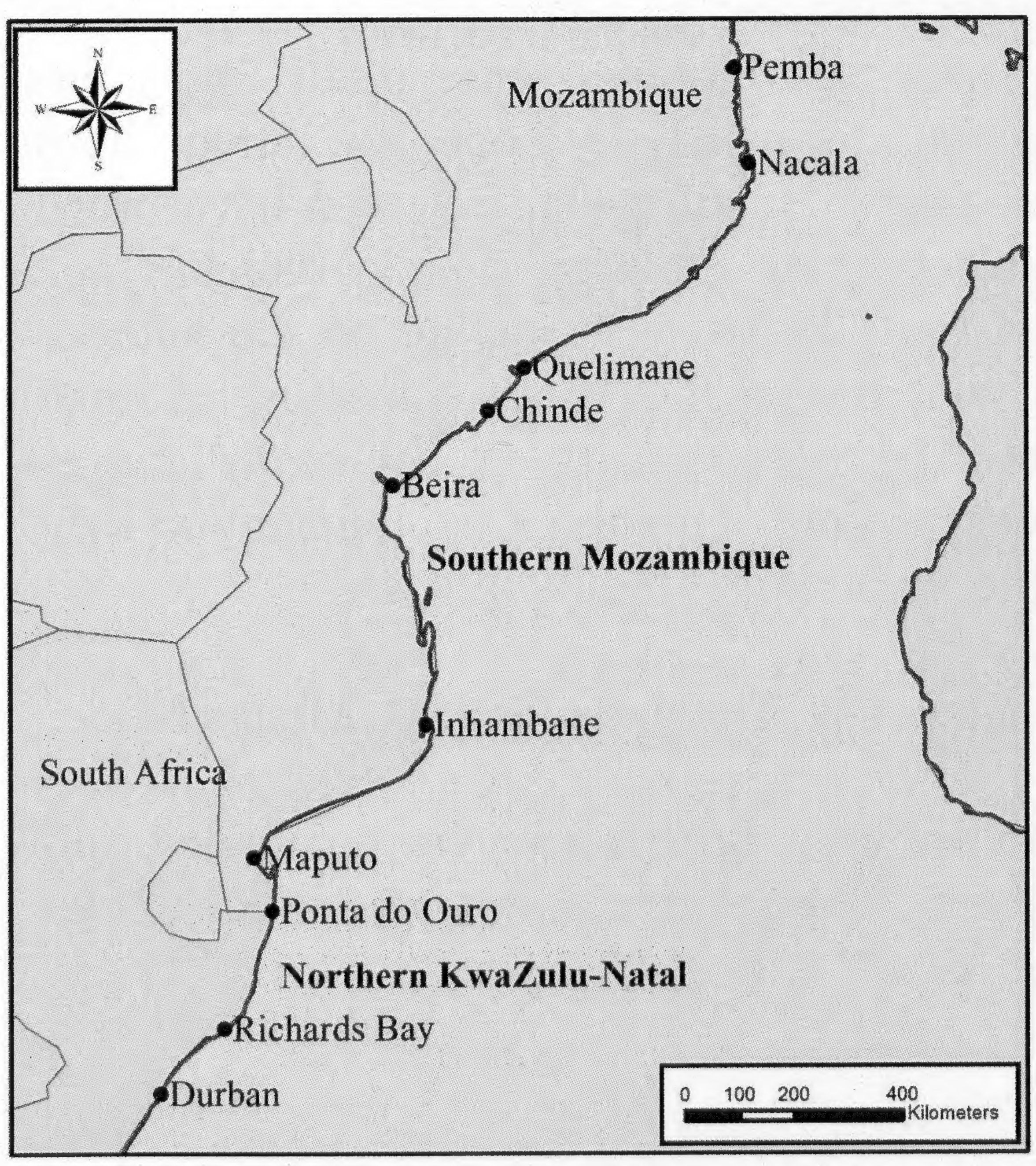

Figure 1. The main locality points from southern Mozambique and northern KwaZulu-Natal, South Africa, where *P.* (*P.*) *nemo* n. sp. and *P.* (*P.*) *chindeensis* occur.

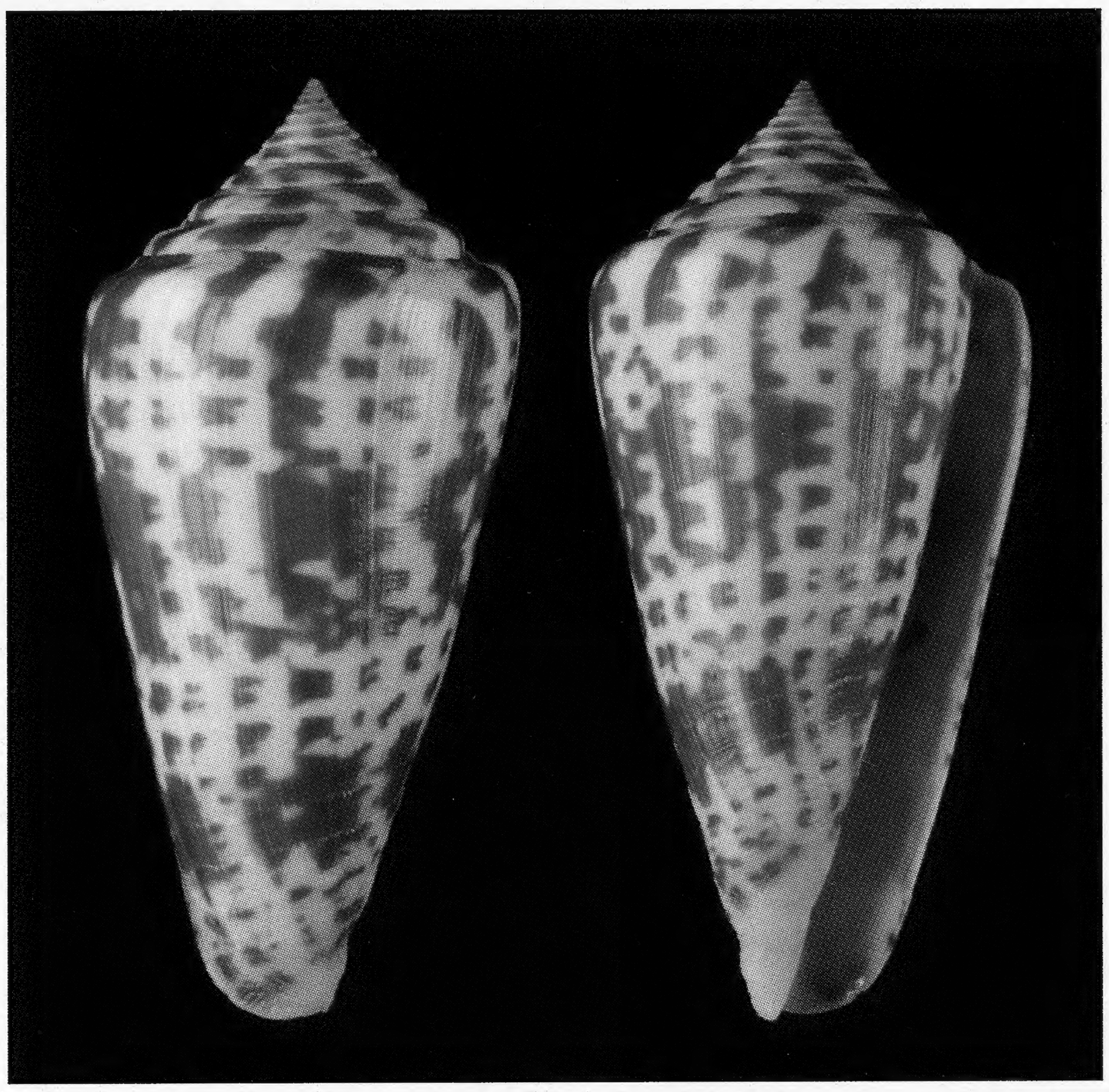

Figure 2. The holotype of *Phasmoconus (Phasmoconus) chindeensis* Monnier, Prugnaud & Limpalaër, 2021, trawled 45-65m Chinde, Mozambique. Muséum national d'Histoire naturelle, Paris (France), MNHN-IM-2000-35083. Photo credit: Alexandre Lardeur (2021).

METHODOLOGY

Main shell morphological features were used during this study to differentiate the new species from its closest congener within the genus *Phasmoconus*. The terminology used within this description follow Röckel *et al.* (1995), Monnier *et al.* (2018), and Monnier *et al.* (2021) along with the author's own statistical editions.

The following measurements were taken for each specimen studied:

- SL – maximum shell length (mm)
- MD – maximum diameter (mm)
- H – height (mm)
- AH – aperture height (mm)
- HMD – height of maximum diameter (mm)
- SH – spire height (SL-AH)
- SP – spire percentage of length (SH/SL x 100)

- RD – relative diameter (MD/AH)
- PMD – relative position of the maximum diameter (HMD/AH)
- RSH – relative spire height (SH/SL)
- W – shell weight (g)
- V – estimated 'model' volume (SL x MD x H)
- RW – relative shell weight 'length' (W/SL)
- RW – relative shell weight 'volume' (W/V)
- SR – shell ratio factor (SL/MD x PMD)

A total of 83 adult specimens from Mozambique and northern KwaZulu-Natal, South Africa, were studied, measured, and included in the data tables (Annexure A). Several juvenile specimens were studied but were not included in the data tables. The shell features of another 34 specimens in the Natal Museum (NMSA) were examined. The measurements of the Holotype and the 28 specimens from *P.* (*P.*) *chindeensis*, as per Monnier *et al.* (2021), were closely studied.

SYSTEMATICS

Phylum Mollusca Linnaeus,1758
Class Gastropoda Cuvier, 1795
Subclass Caenogastropoda Cox, 1960
Order Neogastropoda Wenz, 1938
Superfamily Conoidea Fleming, 1822
Family Conidae Fleming, 1822
Genus *Phasmoconus* Mörch, 1852
Subgenus *Phasmoconus* Mörch, 1852

Phasmoconus (Phasmoconus) nemo
S.G.Veldsman, n. sp.

Description. Medium to large, heavy shell. Profile conical, moderately stepped spire of moderate height with slightly concave outline (Figures 3, 14.1 & 15). Deep incised sutures on spire. The spire consists of thin spiraling grooves, comprising of five or six wide grooves from the suture, followed by a prominent ridge, followed by several thinner grooves, followed by a wide ridge before smoothing out to the outer part of the whorl. Shoulder sharp, slightly convex. Body whorl sides are slightly rounded with a convex shape. The posterior quarter is smooth, followed by the second quarter having shallow grooves around the body whorl, with the anterior half having deeper grooves alternating with ridges, the last quarter the ridges having small knobs. Protoconch moderately sharp, off-white to cream in color. Aperture narrow at posterior side, slightly bend, flaring out at the anterior sinus.

Background color off-white, with the coloration in bands of small and large blocks of an orange-brown color. The colored bands are usually as follows, from the posterior to anterior side: small zig-zag blocks below the shoulder, followed by two to three thin bands consisting of spots, followed by a broad band consisting of large zig-zag blotches and small spots in-between, followed by one to three lines consisting of small spots, followed by a broad band consisting of large zig-zag blotches and small spots in-between, ending on the anterior side with several thin bands consisting of small spots. The spire consists of the same orange-brown marking. Aperture a light creamy to light purple, sometimes slightly pinkish.

Type locality. Trawled off Beira, Mozambique.

Distribution. Specimens were trawled off southern Mozambique and northern KwaZulu-Natal, South Africa.

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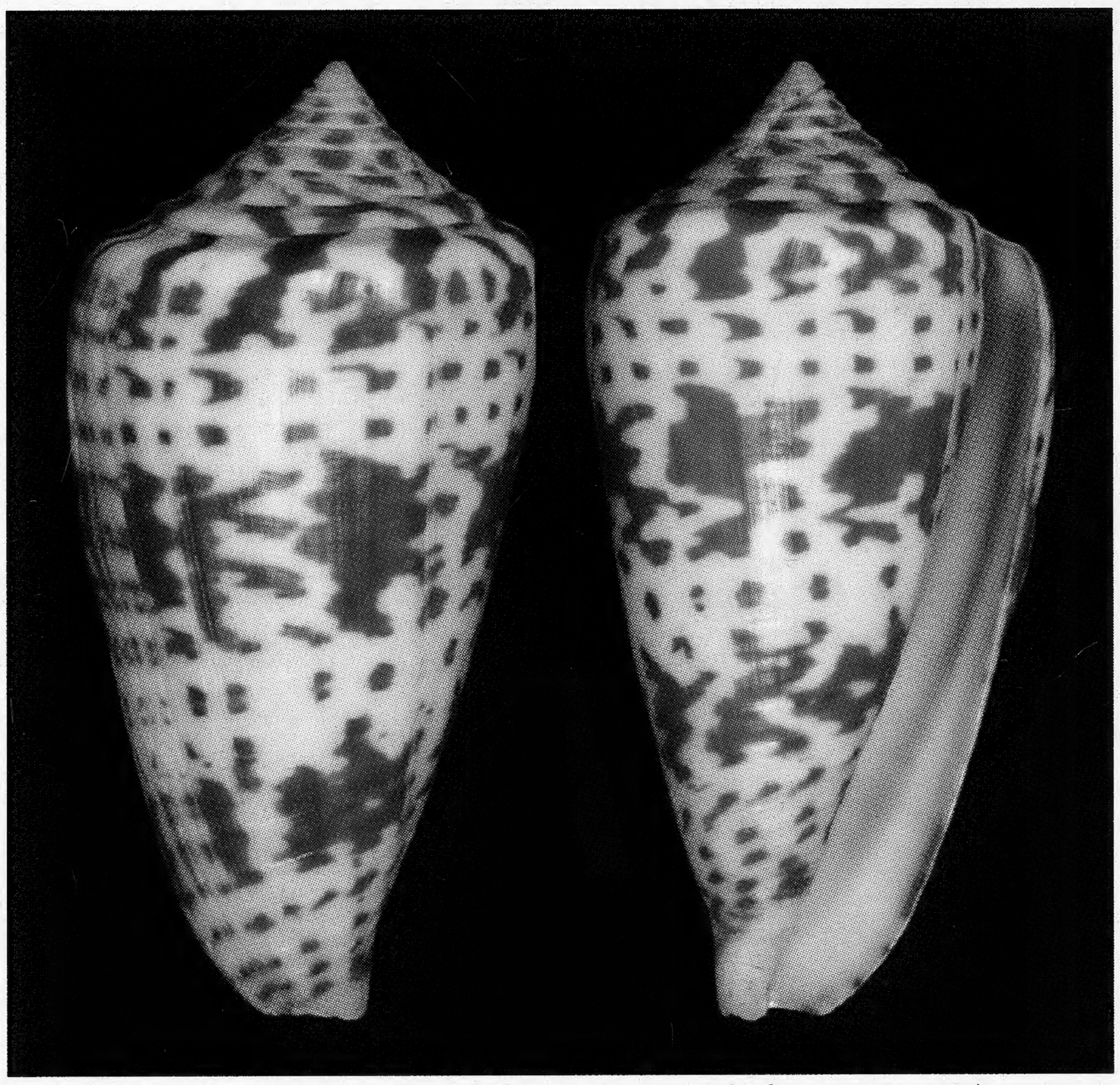

Figure 3. The holotype of *Phasmoconus* (*Phasmoconus*) *nemo* n. sp., trawled off Beira, Mozambique, NMSA: P1950/T4528.

Type material.

Holotype: 57.21 x 27.30 mm (Figure 14.1); Trawled off Beira, Mozambique; Coll. Natal Museum, Pietermaritzburg, South Africa (NMSA), ID No: P1950/T4528.

Paratype 1: 56.30 x 26.79 mm (Figure 15.1); Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 2: 55.09 x 26.17 mm (Figure 15.2); Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 3: 55.21 x 26.78 mm (Figure 15.4); Trawled off Beira, Mozambique; L.Swart Collection.

Paratype 4: 53.57 x 26.65 mm (Figure 15.5); Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 5: 59.11 x 28.65 mm (Figure 15.3); Trawled off northern KwaZulu-Natal, South Africa; Veldsman Collection.

Paratype 6: 55.12 x 26.35 mm (Figure 15.7); Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 7: 63.04 x 29.72 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 8: 56.24 x 26.58 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 9: 57.04 x 27.46 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 10: 57.73 x 26.63 mm (Figure 15.8); Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 11: 48.45 x 23.19 mm; Trawled off southern Mozambique; Veldsman Collection.

Paratype 12: 56.10 x 26.14 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 13: 52.47 x 25.45 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 14: 53.34 x 24.91 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 15: 52.36 x 24.85 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 16: 51.33 x 24.93 mm (Figure 15.6); Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 17: 56.30 x 27.81 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 18: 53.64 x 25.02 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 19: 40.66 x 19.91 mm; Trawled off southern Mozambique; Veldsman Collection.

Paratype 20: 47.66 x 22.88 mm; Trawled off Beira, Mozambique; Veldsman Collection.

Paratype 21: 45.05 x 20.90 mm; Trawled off Beira, Mozambique; Veldsman Collection.
Paratype 22: 48.30 x 22.50 mm; Trawled off northern KwaZulu-Natal, South Africa; A.Potgieter Collection.
Paratype 23: 39.03 x 18.80 mm; Trawled off southern Mozambique; Veldsman Collection.
Paratype 24: 50.26 x 24.50 mm; Trawled off Beira, Mozambique; A. Groenewald Collection.

Etymology. The name "*nemo*" translates to 'no one' or 'nobody'. No one expected that there is another species within this group of similar looking shells.

DISCUSSION

Phasmoconus (*P.*) *nemo* n. sp. and the two forms of *P.* (*P.*) *chindeensis* are all three medium to large in size, moderately solid to solid. In all three the background color apex, spire and body whorl are similarly off-white. The color pattern of all three, as with all the species within this "complex" of species in the genus *Phasmoconus*, are very similar and can't be used for separation between the species and forms. The coloration of the aperture inside is very inconsistent between shells of the two species and forms, with all having an off-white background, with some adult specimens having a pinkish coloration and others more purple. The more significant differences are summarized in Table 1.

	***P.* (*P.*) *chindeensis* - A**	***P.* (*P.*) *chindeensis* - B**	***P.* (*P.*) *nemo* n. sp.**
Shell profile	Profile conical, straight with a slightly convex profile.	Profile conical, straight with a slightly convex profile.	Profile conical, rounded convex profile.
Spire	Moderately stepped spire, of moderate height with slightly concave outline. Moderately deep incised sutures on spire.	Moderately stepped spire, low with slightly concave outline. Moderately deep incised sutures on spire.	Moderate to highly stepped spire of moderate height with slightly concave outline deep incised sutures on spire.
Shoulder	Shoulder subangulate.	Shoulder subangulate.	Shoulder subangulate, slightly rounded and convex.
Grooves on body whorl	The anterior half shallower grooves alternating with ridges, having small knobs. The grooves vary in width.	The anterior half shallower grooves alternating with ridges, having small knobs. The grooves vary in width.	The anterior half having wider, deeper grooves alternating with ridges having prominent knobs.
Aperture	Aperture narrow, moderately straight, only slightly rounded on the inner side, staying narrow towards the anterior sinus.	Aperture narrow, moderately straight, only slightly rounded on the inner side, staying narrow towards the anterior sinus.	Aperture narrow at posterior side, slightly bend, flaring out at the anterior sinus.

Table 1. Summarized shell morphological differences between *P.* (*P.*) *nemo* n. sp. and the forms of *P.* (*P.*) *chindeensis* (A & B).

The morphometric parameters for the adult specimens of *P.* (*P.*) *nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P. (P.) chindeensis* Form B are summarized in Tables 2 and 3, whereas the detailed information is tabled in Annexure A. A total of 25 *P.* (*P.*) *nemo* n. sp. specimens, 30 *P.* (*P.*) *chindeensis* Form A, and 28 *P.* (*P.*) *chindeensis* Form B were measured and used in the analysis. Most of the morphometric parameters are very similar and overlapping, and characteristic of the *Phasmoconus* genus. The two forms of *P.* (*P.*) *chindeensis* show very similar morphological parameters, except that Form B has generally a shorter spire, with a smaller percentage to shell length (mean of 14.72%) than Form A (mean of 16.47%).

The maximum height of the diameter of *P.* (*P.*) *nemo* n. sp. is on average smaller (mean HMD of 38.27, mean PMD of 0.86) than *P.* (*P.*) *chindeensis* Form A (mean HMD of 40.20, mean PMD of 0.90) and *P.* (*P.*) *chindeensis* Form B (mean of HMD of 39.05, mean PMD of 0.87), where the relative diameter of *P.* (*P.*) *nemo* n. sp. is higher (mean RD of 0.57) than *P.* (*P.*) *chindeensis* Form A (mean RD of 0.55) and *P.* (*P.*) *chindeensis* Form B (mean RD of 0.54) (Table 2).

	Maximum length (SL) - mm	**Maximum diameter (MD) - mm**	**Height (H) - mm**	**Aperture height (AH) - mm**	**Height of maximum diameter (HMD) - mm**	**Relative Diameter (RD)**	**Relative position of the maximum diameter (PMD)**
***P.* (*P.*) *nemo* n. sp. (25 specimens)**							
Range	39.03 - 63.04	18.80 - 29.72	17.20 - 27.08	31.38 - 54.51	26.99 - 46.47	0.55 - 0.60	0.84 - 0.89
Mean	52.82	25.23	23.20	44.53	38.27	0.57	0.86
***P.* (*P.*) *chindeensis* Form A (30 specimens)**							
Range	38.47 - 69.05	17.72 - 31.85	16.32 - 29.09	31.28 - 58.00	28.80 - 52.51	0.51 - 0.57	0.85 - 0.92
Mean	53.58	24.42	22.49	44.82	40.20	0.55	0.90
***P.* (*P.*) *chindeensis* Form B (28 specimens)**							
Range	39.52 - 65.21	18.47 - 29.39	17.33 - 27.21	32.58 - 56.51	28.63 - 49.18	0.50 - 0.57	0.83 - 0.91
Mean	52.44	24.31	22.44	44.78	39.05	0.54	0.87

Table 2. Morphometric parameters including SL, MD, H, AH, HMD, RD and PMD for the adult specimens of *P.* (*P.*) *nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P.* (*P.*) *chindeensis* Form B.

The most significant parameter is the shell ratio factor, *P.* (*P.*) *nemo* n. sp. has a mean of 1.80, *P.* (*P.*) *chindeensis* Form A, a mean of 1.97, and *P.* (*P.*) *chindeensis* Form B, a mean of 1.88 (Table 3).

	Spire Height (SH) - mm	Relative Spire height (RSH)	Weight (W) - g	Relative shell weight 'length' (RW)	Estimated 'model' volume (V)	relative shell weight 'volume' (RW')	Spire % of length (SP)	Shell ratio factor (SR)
***P. (P.) nemo* n. sp. (25 specimens)**								
Range	6.82 - 9.62	0.13 - 0.20	5.60 - 22.75	0.14 - 0.36	12.62 - 50.74	0.39 - 0.50	13.15 - 19.60	1.71 - 1.89
Mean	8.30	0.16	13.94	0.26	31.86	0.44	15.82	1.80
***P. (P.) chindeensis* Form A (30 specimens)**								
Range	5.54 - 11.05	0.10 - 0.20	5.27 - 23.63	0.14 - 0.34	11.13 - 63.98	0.37 - 0.47	10.11 - 20.40	1.82 - 2.13
Mean	8.76	0.16	12.54	0.23	30.98	0.41	16.47	1.97
***P. (P.) chindeensis* Form B (28 specimens)**								
Range	4.12 - 10.33	0.10 - 0.21	5.72 - 20.99	0.14 - 0.32	12.65 - 52.15	0.37 - 0.51	10.19 - 21.43	1.72 - 2.06
Mean	7.67	0.15	12.31	0.23	29.77	0.42	14.72	1.88

Table 3. Morphometric and weight parameters including SH, RSH, W, RW, V, RW', SP, and the shell ratio factor for the adult specimens of *P.* (*P.*) *nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P.* (*P.*) *chindeensis* Form B.

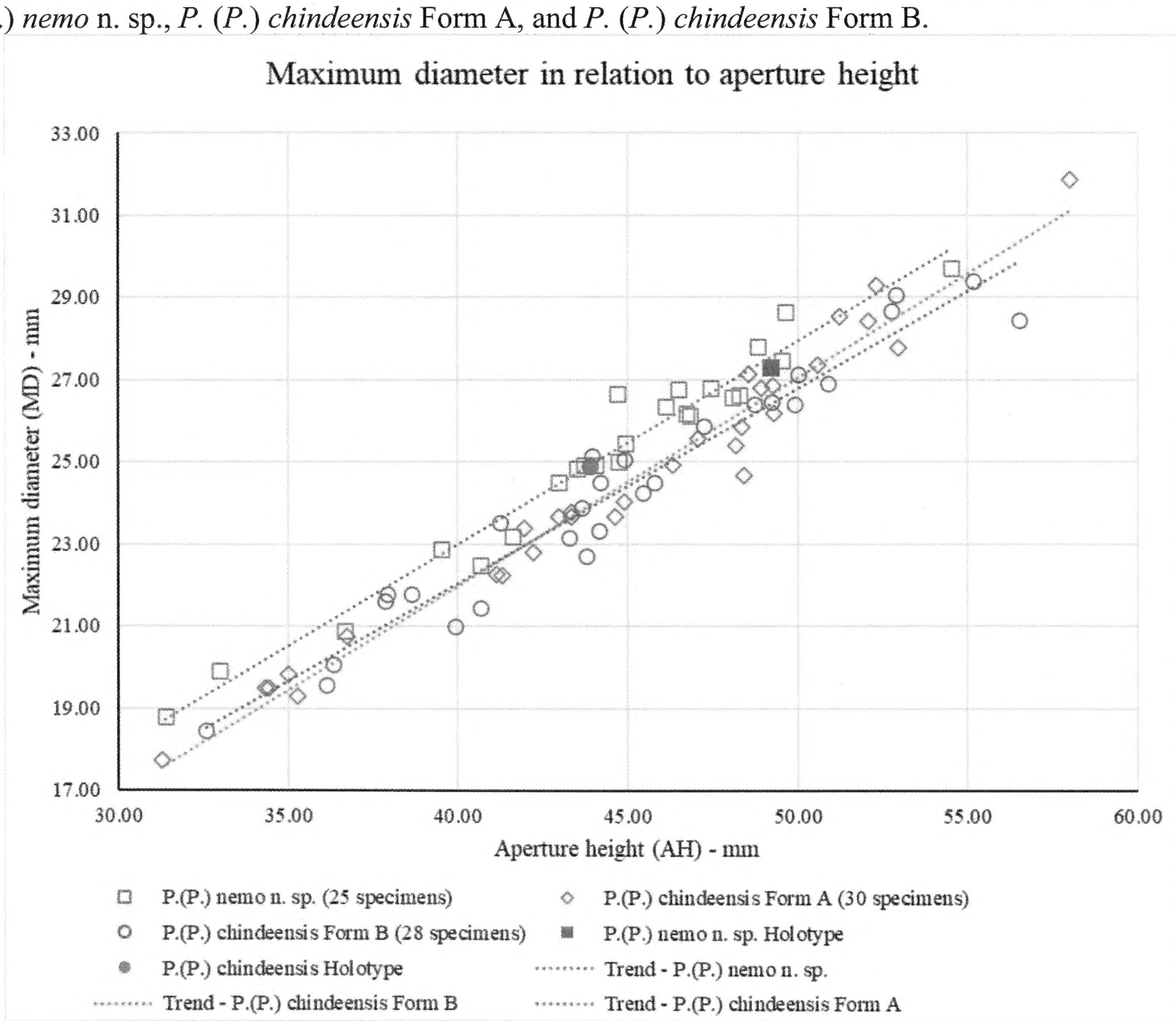

Figure 4. Illustration of the maximum diameter (MD) of the shell in relation to the aperture height (AH) for the adult specimens of *P.* (*P.*) *nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P.* (*P.*) *chindeensis* Form B.

The new species has a slightly different trend regarding the maximum diameter in relation to the aperture height (Figure 4), whereas the trend of the two forms *P.* (*P.*) *chindeensis* is very similar.

Phasmoconus (*P.*) *nemo* n. sp. has a slightly different trend regarding the maximum diameter in relation to the height of maximum diameter (Figure 5), whereas the trend of the two forms *P.* (*P.*) *chindeensis* is very similar.

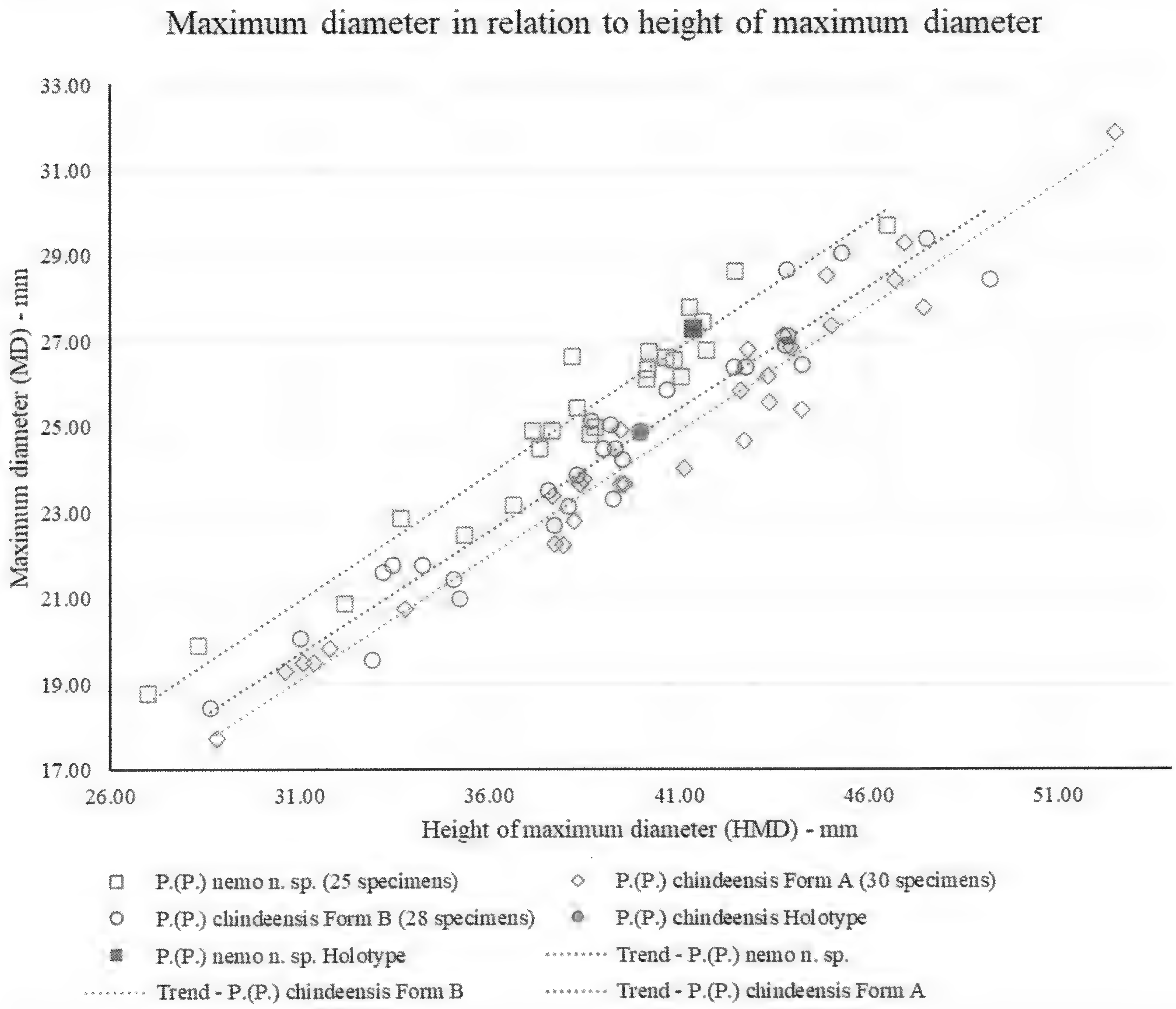

Figure 5. Illustration of the maximum diameter (MD) of the shell in relation to the height of maximum diameter (HMD) for the adult specimens of *P. (P.) nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P.* (*P.*) *chindeensis* Form B.

The relative diameter in relation to the relative position of the maximum diameter *P.* (*P.*) *nemo* n. sp. fills a different plot area with a very different trend (Figure 6) than that of the two forms of *P.* (*P.*) *chindeensis*.

The shell ratio factor in relation to the spire percentage to shell length, the two forms of *P.* (*P.*) *chindeensis* have slightly different trends, but their plotting areas overlap over most of the plotting area (Figure 7), with *P.* (*P.*) *nemo* n. sp. mostly filling its own plotting space with a very different trend.

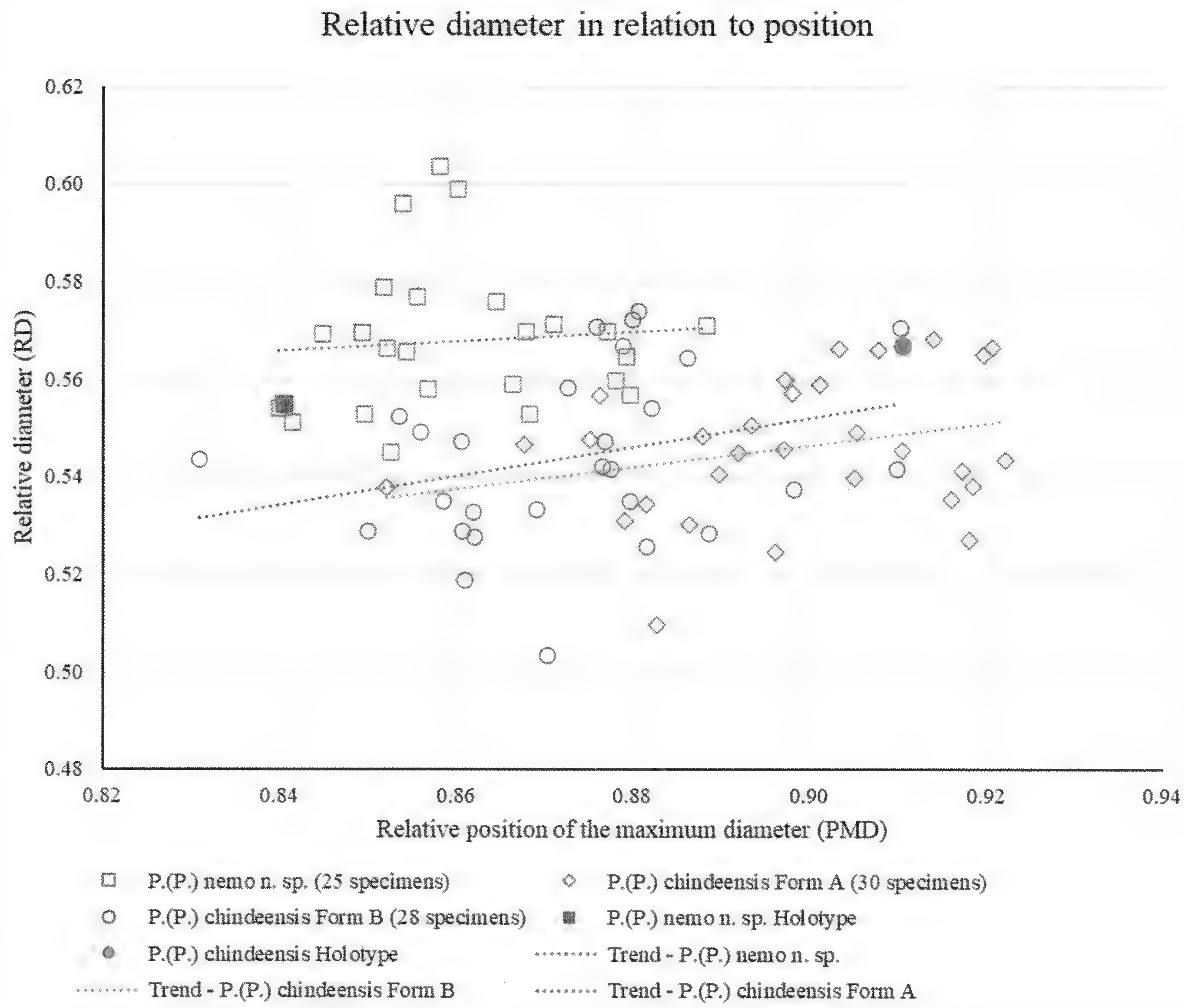

Figure 6. Illustration of the relative diameter (RD) of the shell in relation to the relative position of the maximum diameter (PMD) for the adult specimens of *P.* (*P.*) *nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P.* (*P.*) *chindeensis* Form B.

The spiral grooves of each of the *Phasmoconus* species are only slightly different as illustrated in Figures 8-12, concurring with Monnier *et al.* (2021). The spiral grooves of *P.* (*P.*) *nemo* n. sp. (Figure 8) comprise of five or six wide grooves from the suture, followed by a prominent ridge, followed by several thinner grooves, followed by a wide ridges before smoothing out to the outer part of the whorl. The spiral grooves *P.* (*P.*) *chindeensis* (Figure 9) is confirmed to be as illustrated by Monnier *et al.* (2021), with five or six wide grooves close to the suture, followed by a moderately thin ridge, followed by a few thinner grooves, smoothing out towards the outer part as per Form A (Figure 9), where Form B (Figure 10) has slightly thinner grooves from the ridge before smoothing out. The spiral grooves of *P.* (*P.*) *adenensis* (Figure 11) has three broad grooves from the suture, followed by several moderately wide grooves before smoothing out to the outer part of the whorl. The spiral grooves of *P.* (*P.*) *inscriptus* (Figure 12) comprises of four to six moderately wide grooves with the areas in between the grooves having clear thin radial ridges, whereafter smoothing out towards the outer part of the whorl.

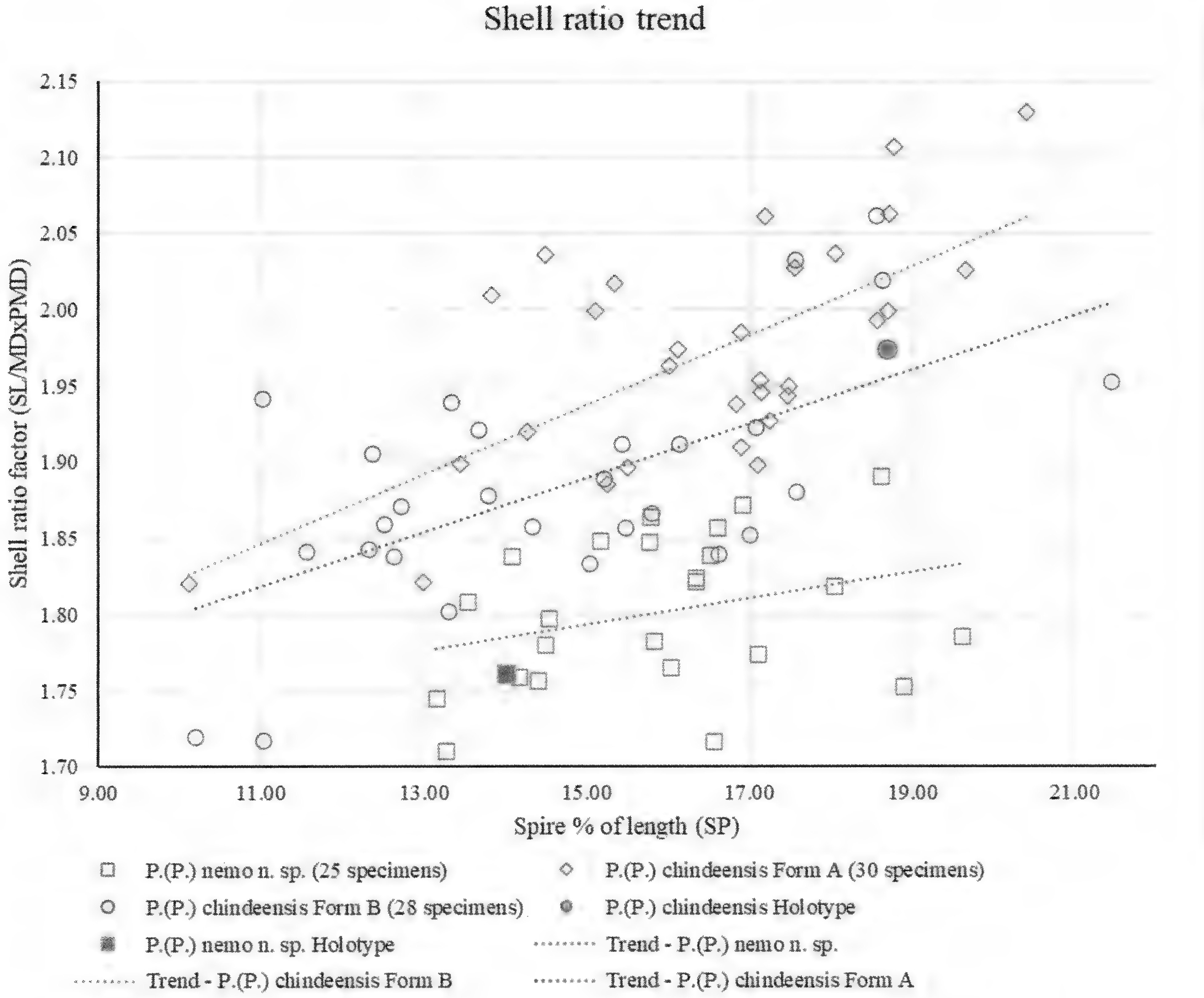

Figure 7. Illustration of the shell ration factor (SR) of the shell in relation to the spire as a percentage of shell length for the adult specimens of *P.* (*P.*) *nemo* n. sp., *P.* (*P.*) *chindeensis* Form A, and *P.* (*P.*) *chindeensis* Form B.

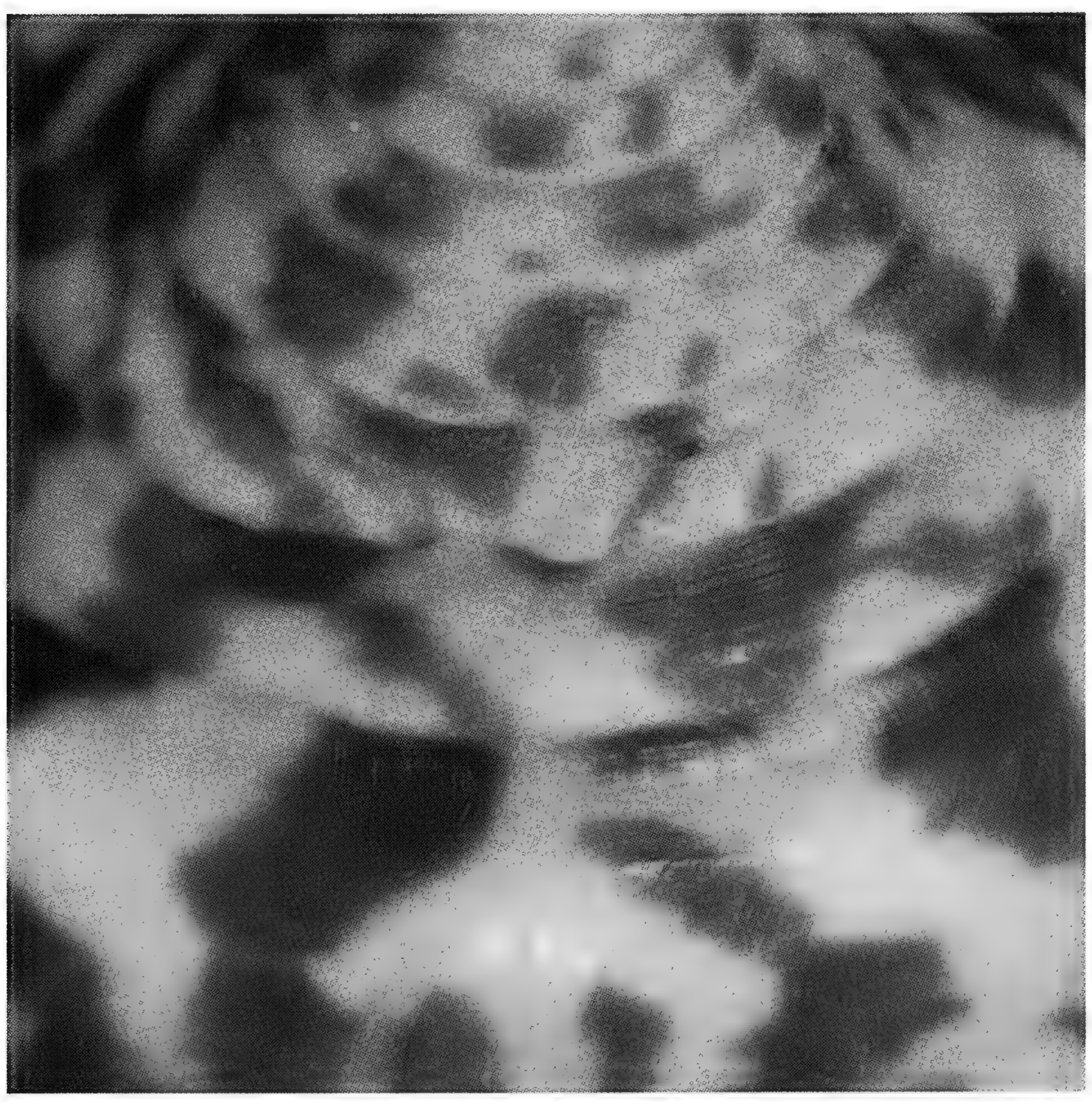

Figure 8. Spire closeup of *P.* (*P.*) *nemo* n. sp. Holotype to indicate the spiral grooves.

Figure 9. Spire closeup of a representative specimen of *P.* (*P.*) *chindeensis* Form A to indicate the spiral grooves.

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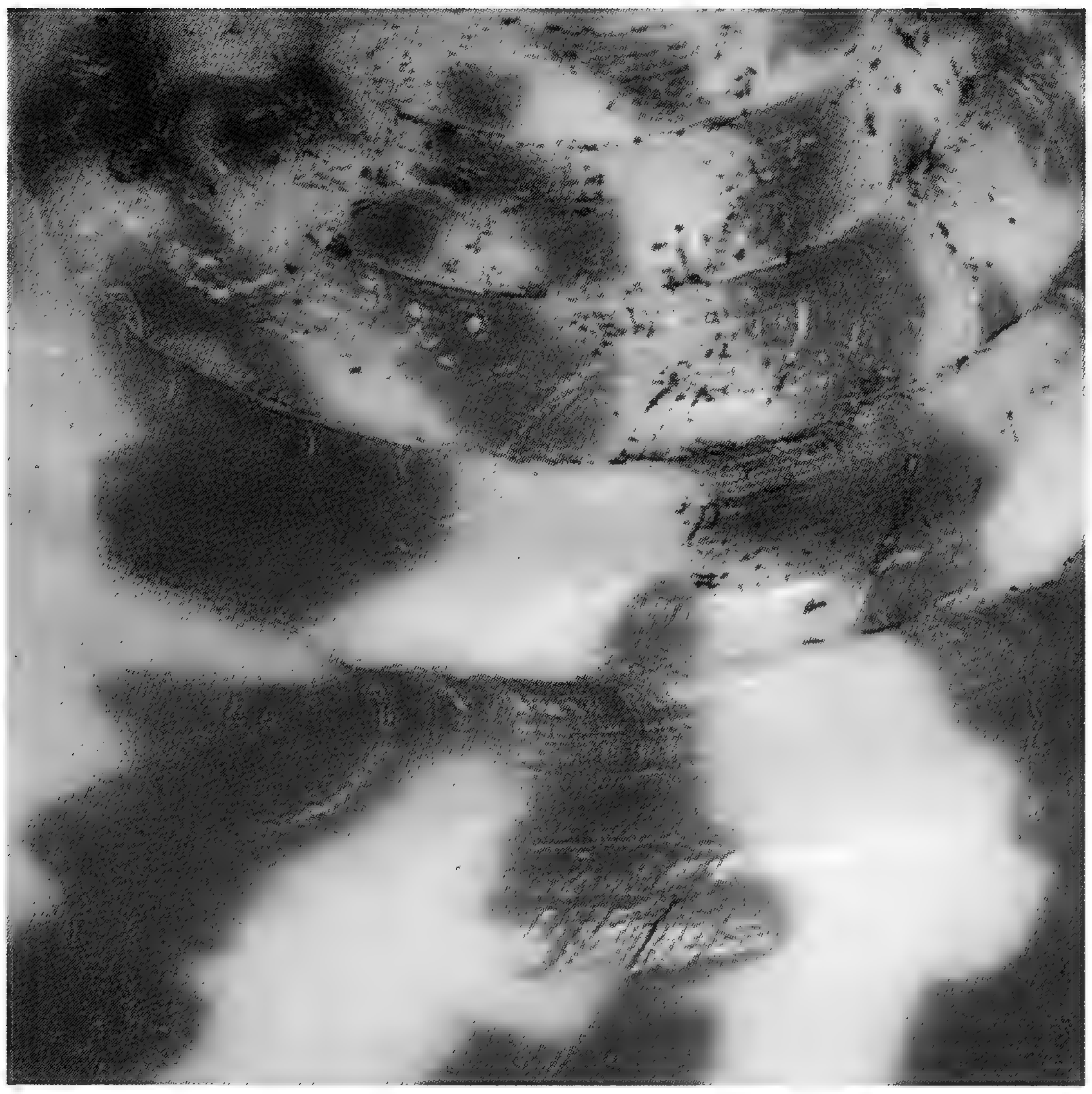

Figure 10. Spire closeup of a representative specimen of *P.* (*P.*) *chindeensis* Form B to indicate the spiral grooves.

Figure 11. Spire closeup of a representative specimen of *P.* (*P.*) *adenensis* to indicate the spiral grooves.

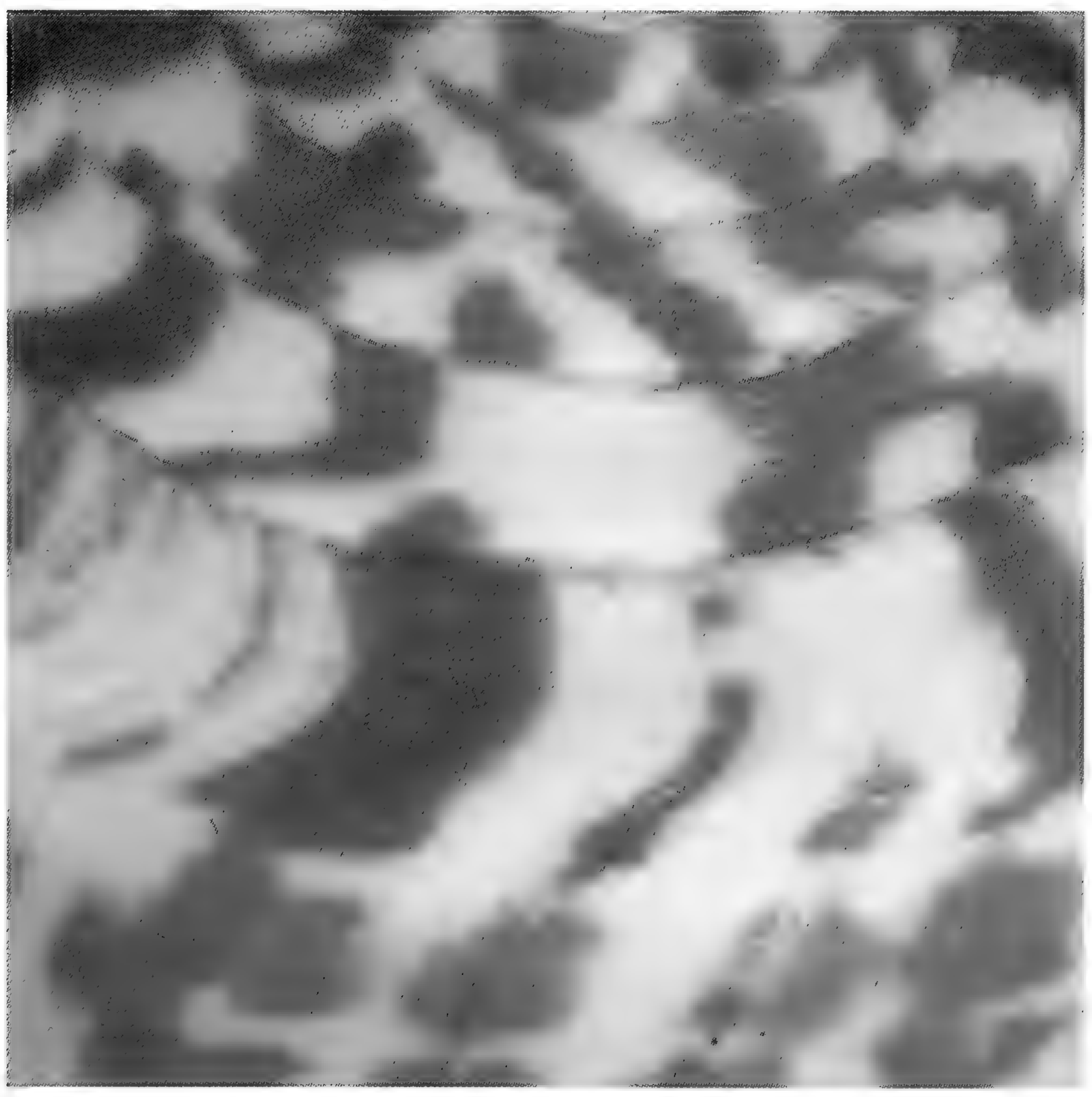

Figure 12. Spire closeup of a representative specimen of *P.* (*P.*) *inscriptus* to indicate the spiral grooves.

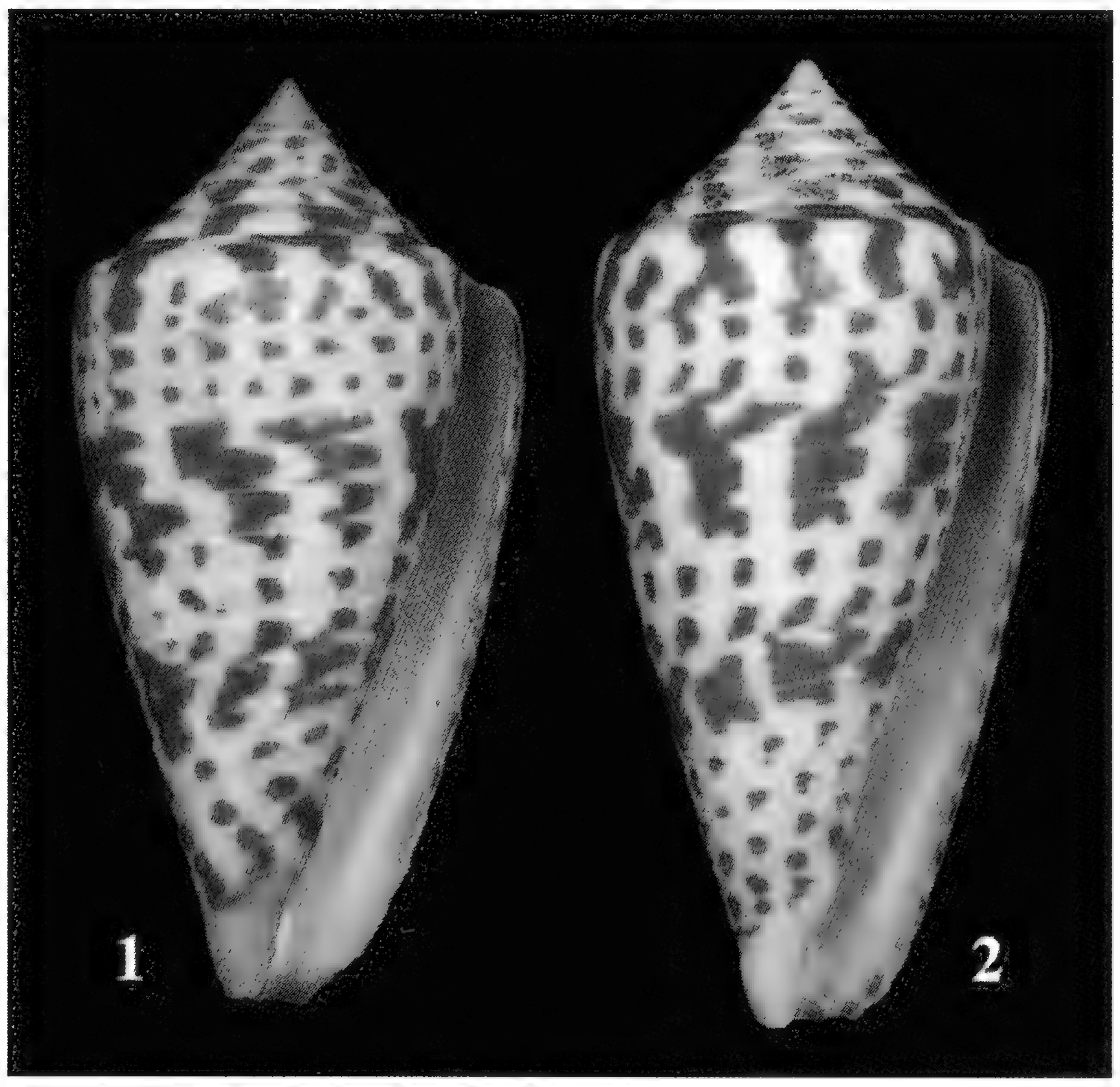

Figure 13. Two young specimens to illustrate the morphological differences. **1.** *P.* (*P.*) *nemo* n. sp. Paratype 19 (40.66 x 19.91 mm), southern Mozambique; **2.** *P.* (*P.*) *chindeensis* (42.43 x 19.82 mm), Tofo, southern Mozambique.

CONCLUSION

Within a challenging "complex" in the genus *Phasmoconus,* Monnier *et al.* (2021) provides an extensive comparison between several of the species, subspecies and synonymized names. On this background the author studied the species described by Monnier *et al.* (2021) intensively with many shells in-hand, from where two main forms of *P.* (*P.*) *chindeensis* are identified and a group of shells different from the rest, now named *P.* (*P.*) *nemo* n. sp. Two forms of *P.* (*P.*) *chindeensis* are identified, but too few characteristics separate them to confirm it to be different species. *Phasmoconus* (*P.*) *nemo* n. sp. is different from the rest having a more rounded shell morphological feature, high spire with a slightly convex shape, broad shoulder in relation to shell length. The aperture is narrow at the posterior side, slightly bend, and flaring out at the anterior sinus. The spiral grooves of the species are different from each other as discussed above. The differences between *P.* (*P.*) *chindeensis* and *P.* (*P.*) *nemo* n. sp. are especially visible in younger specimens as illustrated in Figure 13.

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LITERATURE CITED

Monnier, E., Limpalaër, L., Robin, A. & Roux, C. 2018. A Taxonomic Iconography of Living Conidae. 2 Volumes. Conchbooks, Arxheim, Germany. 1207 pp.

Monnier, E., Prugnaud, F. & Limpalaër, L. 2021. *Phasmoconus (Phasmoconus) chindeensis* sp. nov. (Gastropoda:Conidae), new species from Mozambique channel. Xenophora Taxonomy 31:3-24.

Röckel, D., Korn, W. & Kohn, A.J. 1995. Manual of the living Conidae. Verlag Christa Hemmen, Grillparzerstr, Germany. 517 pp.

Cite as: Veldsman, S.G. 2022 Description of *Phasmoconus (Phasmoconus) nemo* n. sp. (Gastropoda: Conidae) from south-eastern Africa. The Festivus 54(2):82-100.
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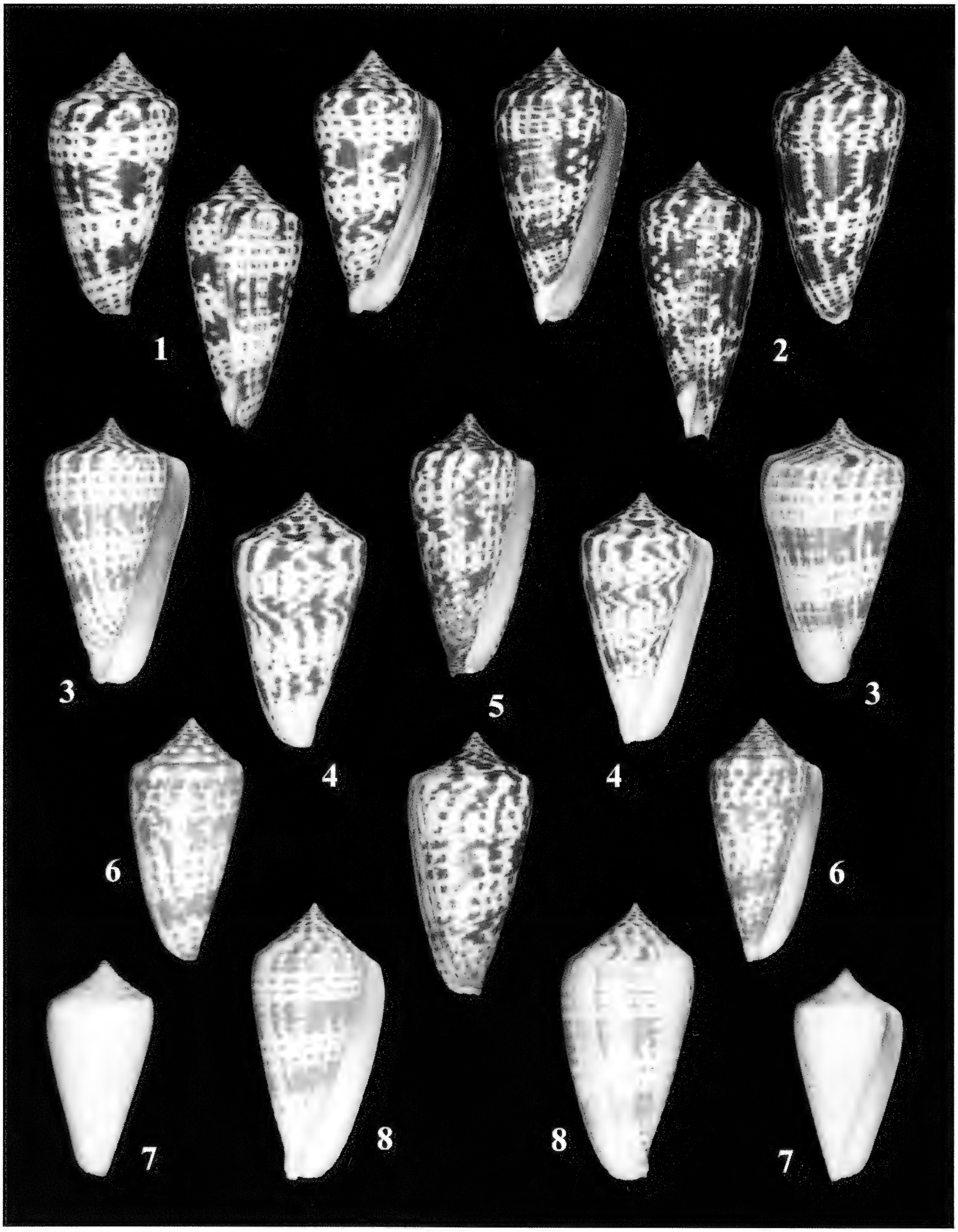

Figure 14. **1.** *Phasmoconus* (*P.*) *nemo* n. sp. Holotype: 57.21 x 27.30 mm; Trawled off Beira, Mozambique; NMSA: P1950/T4528. **2.** *P.* (*P.*) *chindeensis* Form A 60.16 x 28.42 mm; Trawled off northern KwaZulu-Natal, South Africa; Veldsman Coll. **3.** *P.* (*P.*) *inscriptus* 57.66 x 30.99 mm; Dredged 10 m Chennai, India; Veldsman Coll. **4.** *P.* (*P.*) *inscriptus kaetiformis* 55.08 x 28.52 mm; Dredged 10 m Chennai, India; Veldsman Coll. **5.** *P. (P.) chindeensis* Form B 57.12 x 26.41 mm; Trawled off Beira, Mozambique; Veldsman Coll. **6.** *P.* (*P.*) *adenensis* 52.87 x 24.51 mm; off northern Somalia; Veldsman Coll. **7.** *P.* (*P.*) *inscriptus cuneiformis* 47.01 x 23.64 mm; Trawled 20-30 m Keelakarai, India; Veldsman Coll. **8.** *P.* (*P.*) *maculospira* 60.00 x 28.31 mm; Trawled off Phuket Island, Thailand; Veldsman Coll.

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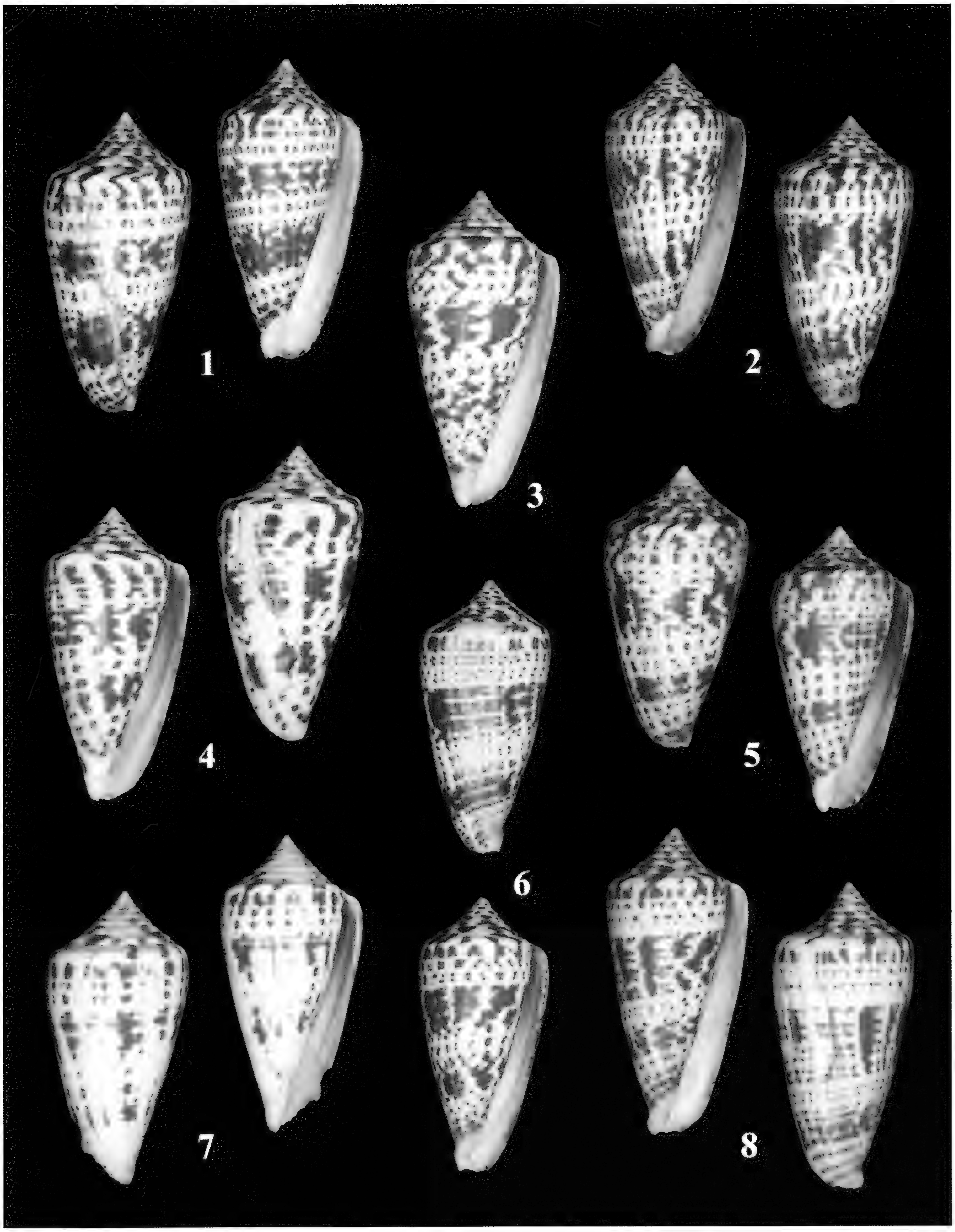

Figure 15. **1.** *Phasmoconus* (*P.*) *nemo* n. sp. Paratype 1: 56.30 x 26.79 mm; Trawled off Beira, Mozambique; Veldsman Coll. **2.** *P.* (*P.*) *nemo* n. sp. Paratype 2: 55.09 x 26.17 mm; Trawled off Beira, Mozambique; Veldsman Coll. **3.** *P.* (*P.*) *nemo* n. sp. Paratype 5: 59.11 x 28.65 mm; Trawled off northern KwaZulu-Natal, South Africa; Veldsman Coll. **4.** *P.* (*P.*) *nemo* n. sp. Paratype 3: 55.21 x 26.78 mm; Trawled off Beira, Mozambique; Veldsman Coll. **5.** *P.* (*P.*) *nemo* n. sp. Paratype 4: 53.57 x 26.65 mm; Trawled off Beira, Mozambique; Veldsman Coll. **6.** *P.* (*P.*) *nemo* n. sp. Paratype 16: 51.33 x 24.93 mm; Trawled off Beira, Mozambique; Veldsman Coll. **7.** *P.* (*P.*) *nemo* n. sp. Paratype 6: 55.12 x 26.35 mm; Trawled off Beira, Mozambique; Veldsman Coll. **8.** *P.*(*P.*) *nemo* n. sp. Paratype 10: 57.73 x 26.63 mm; Trawled off Beira, Mozambique; Veldsman Coll.

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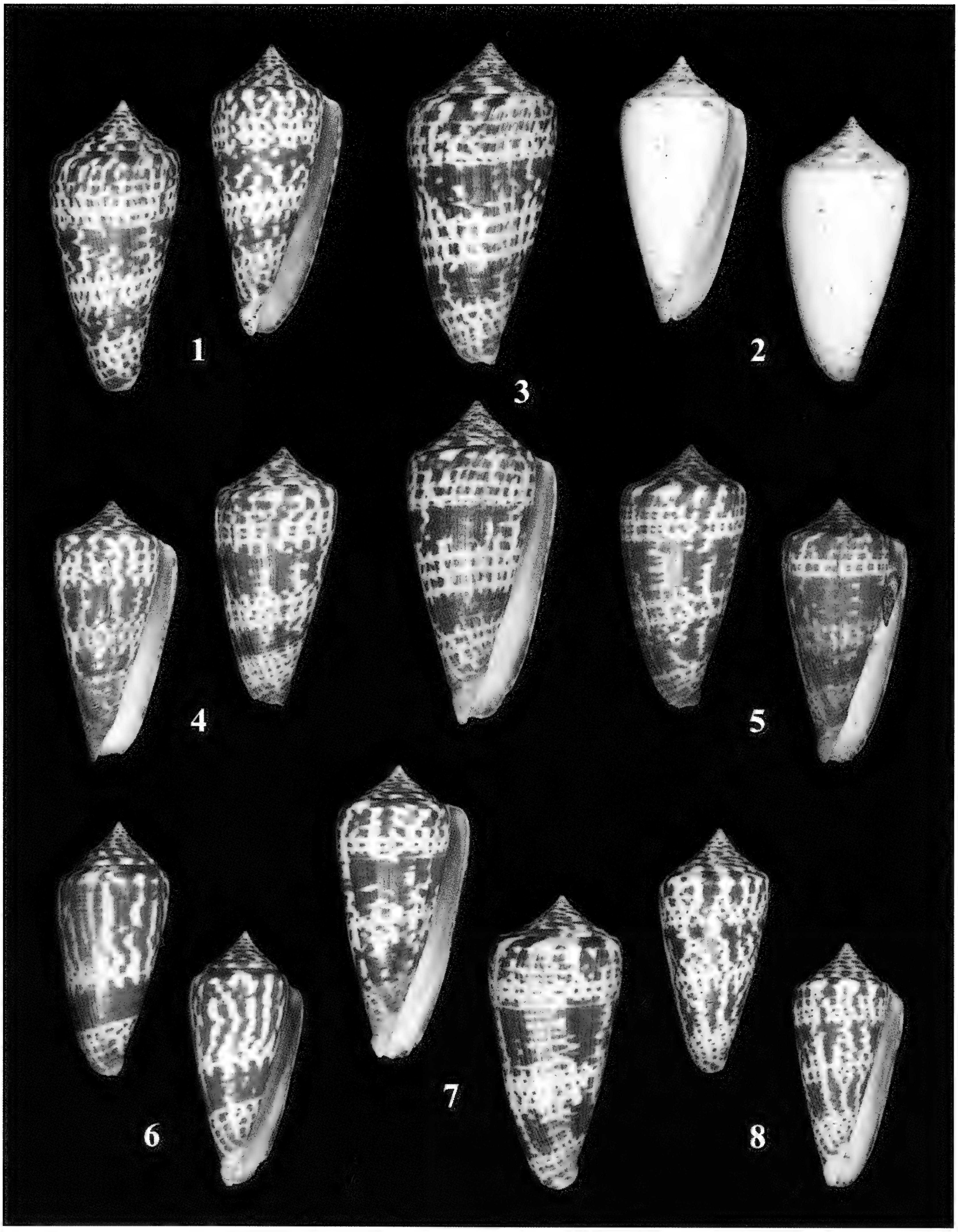

Figure 16. **1.** *Phasmoconus* (*P.*) *chindeensis* Form A 62.56 x 27.79 mm; Trawled southern Mozambique; Veldsman Coll. **2.** *P.* (*P.*) *chindeensis* Form A 57.72 x 26.79 mm; Trawled northern KwaZulu-Natal, South Africa; Veldsman Coll. **3.** *P.* (*P.*) *chindeensis* Form A 69.05 x 31.85 mm; Trawled off Beira, Mozambique; Veldsman Coll. **4.** *P.* (*P.*) *chindeensis* Form B 56.51 x 26.40 mm; Trawled off Quissico, Mozambique; Veldsman Coll. **5.** *P.* (*P.*) *chindeensis* Form B 57.04 x 27.13 mm; Trawled northern KwaZulu-Natal, South Africa; Veldsman Coll. **6.** *P.* (*P.*) *chindeensis* Form A 55.28 x 24.04 mm; Trawled southern Mozambique; Veldsman Coll. **7.** *P.* (*P.*) *chindeensis* Form B 63.50 x 28.46 mm; Trawled off Quissico, Mozambique; Veldsman Coll. **8.** *P.* (*P.*) *chindeensis* Form B 52.96 x 25.16 mm; Trawled southern Mozambique; Veldsman Coll.

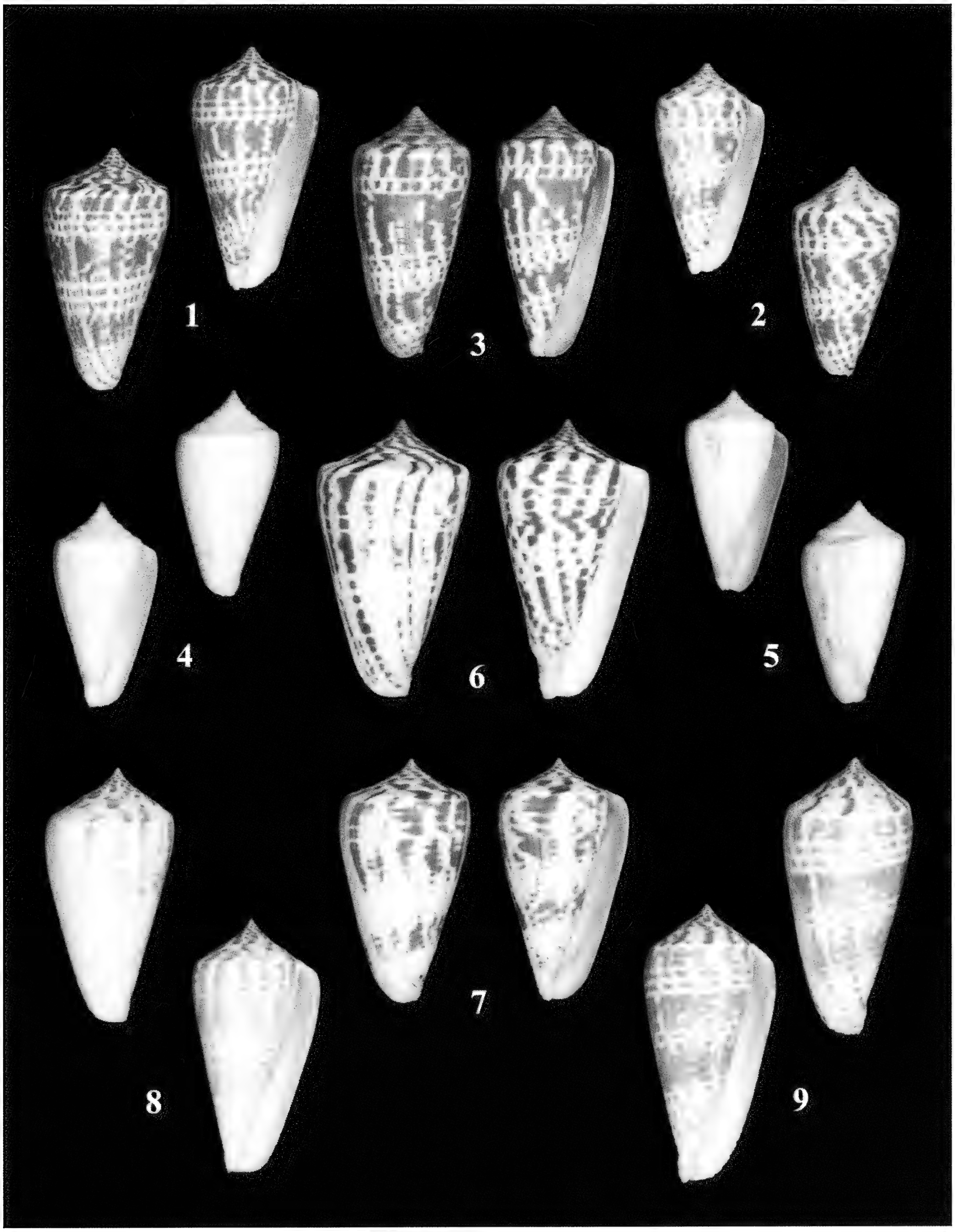

Figure 17. **1.** *Phasmoconus* (*P.*) *inscriptus* 51.90 x 27.34 mm; Trawled India; A.Groenewald Coll. **2.** *P.* (*P.*) *inscriptus* 45.24 x 23.06 mm; Trawled India; A.Groenewald Coll. **3.** *P.* (*P.*) *adenensis* 53.31 x 25.06 mm; off northern Somalia; Veldsman Coll. **4.** *P.* (*P.*) *inscriptus cuneiformis* 44.00 x 22.02 mm; Trawled 20-30 m Keelakarai, India; Veldsman Coll. **5.** *P.* (*P.*) *inscriptus cuneiformis* 42.94 x 22.17 mm; Trawled 20-30 m Keelakarai, India; Veldsman Coll. **6.** *P.* (*P.*) *inscriptus kaetiformis* 59.32 x 32.13 mm; Dredged 10 m Chennai, India; Veldsman Coll. **7.** *P.* (*P.*) *inscriptus kaetiformis* 51.81 x 27.53 mm; Dredged 10 m Chennai, India; Veldsman Coll. **8.** *P.* (*P.*) *maculospira* 54.33 x 27.16 mm; Trawled off Nicobar Island; Veldsman Coll. **9.** *P.* (*P.*) *maculospira* 59.4 x 27.99 mm; Trawled off Phuket Island, Thailand; Veldsman Coll.

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Annexure A – Full data tables of the specimens measured for the study

ID	Max length (SL)	Max diameter (MD)	Height (H)	Aperture Height (AH)	Height of max, diameter (HMD)	Relative Diameter (RD)	Relative position of the max diameter (PMD)	Spiral Height (SH)	Relative Spire height (RSH)	Weight (g)	relative shell weight 'length' (RW)	Estimated 'model' volume (V)	relative shell weight 'volume' (RW')	Spire % of length (SP)	Shell ratio factor (SL/MDxPMD)
***P. (P.) nemo* n. sp. (25 specimens)**															
P. (P.) nemo Holotype	57.21	27.30	25.10	49.20	41.35	0.55	0.84	8.01	0.14	17.15	0.30	39.20	0.44	14.00	1.76
P. (P.) nemo Paratype 1	56.30	26.79	24.83	47.43	41.70	0.56	0.88	8.87	0.16	17.41	0.31	37.45	0.46	15.75	1.85
P. (P.) nemo Paratype 2	55.09	26.17	23.62	46.74	41.04	0.56	0.88	8.35	0.15	16.88	0.31	34.05	0.50	15.16	1.85
P. (P.) nemo Paratype 3	55.21	26.78	24.46	46.48	40.18	0.58	0.86	8.73	0.16	15.52	0.28	36.16	0.43	15.81	1.78
P. (P.) nemo Paratype 4	53.57	26.65	24.64	44.70	38.17	0.60	0.85	8.87	0.17	14.82	0.28	35.18	0.42	16.56	1.72
P. (P.) nemo Paratype 5	59.11	28.65	26.53	49.64	42.47	0.58	0.86	9.47	0.16	17.42	0.29	44.93	0.39	16.02	1.77
P. (P.) nemo Paratype 6	55.12	26.35	24.33	46.12	40.17	0.57	0.87	9.00	0.16	15.53	0.28	35.34	0.44	16.33	1.82
P. (P.) nemo Paratype 7	63.04	29.72	27.08	54.51	46.47	0.55	0.85	8.53	0.14	22.75	0.36	50.74	0.45	13.53	1.81
P. (P.) nemo Paratype 8	56.24	26.58	24.57	48.07	40.84	0.55	0.85	8.17	0.15	15.19	0.27	36.73	0.41	14.53	1.80
P. (P.) nemo Paratype 9	57.04	27.46	25.47	49.54	41.61	0.55	0.84	7.50	0.13	17.12	0.30	39.89	0.43	13.15	1.74
P. (P.) nemo Paratype 10	57.73	26.63	24.06	48.30	40.64	0.55	0.84	9.43	0.16	16.28	0.28	36.99	0.44	16.33	1.82
P. (P.) nemo Paratype 11	48.45	23.19	20.92	41.63	36.62	0.56	0.88	6.82	0.14	9.97	0.21	23.50	0.42	14.08	1.84
P. (P.) nemo Paratype 12	56.10	26.14	23.94	46.84	40.13	0.56	0.86	9.26	0.17	15.78	0.28	35.11	0.45	16.51	1.84
P. (P.) nemo Paratype 13	52.47	25.45	23.28	44.92	38.28	0.57	0.85	7.55	0.14	13.20	0.25	31.09	0.42	14.39	1.76
P. (P.) nemo Paratype 14	53.34	24.91	22.95	43.72	37.13	0.57	0.85	9.62	0.18	12.51	0.23	30.49	0.41	18.04	1.82
P. (P.) nemo Paratype 15	52.36	24.85	23.34	43.51	38.65	0.57	0.89	8.85	0.17	13.00	0.25	30.37	0.43	16.90	1.87
P. (P.) nemo Paratype 16	51.33	24.93	22.65	44.06	37.64	0.57	0.85	7.27	0.14	14.58	0.28	28.98	0.50	14.16	1.76
P. (P.) nemo Paratype 17	56.30	27.81	25.56	48.83	41.25	0.57	0.84	7.47	0.13	18.10	0.32	40.02	0.45	13.27	1.71
P. (P.) nemo Paratype 18	53.64	25.02	22.96	44.74	38.76	0.56	0.87	8.90	0.17	13.57	0.25	30.81	0.44	16.59	1.86
P. (P.) nemo Paratype 19	40.66	19.91	18.23	32.98	28.30	0.60	0.86	7.68	0.19	6.44	0.16	14.76	0.44	18.89	1.75
P. (P.) nemo Paratype 20	47.66	22.88	21.16	39.51	33.65	0.58	0.85	8.15	0.17	10.45	0.22	23.07	0.45	17.10	1.77
P. (P.) nemo Paratype 21	45.05	20.90	19.40	36.67	32.16	0.57	0.88	8.38	0.19	7.76	0.17	18.27	0.42	18.60	1.89
P. (P.) nemo Paratype 22	48.30	22.50	21.36	40.68	35.32	0.55	0.87	7.62	0.16	9.41	0.19	23.21	0.41	15.78	1.86
P. (P.) nemo Paratype 23	39.03	18.80	17.20	31.38	26.99	0.60	0.86	7.65	0.20	5.60	0.14	12.62	0.44	19.60	1.79
P. (P.) nemo Paratype 24	50.26	24.50	22.38	42.98	37.30	0.57	0.87	7.28	0.14	12.13	0.24	27.56	0.44	14.48	1.78
***P. (P.) chindeensis* Form A (30 specimens)**															
N17	54.80	26.85	24.77	49.26	43.94	0.55	0.89	5.54	0.10	14.77	0.27	36.45	0.41	10.11	1.82
N100	53.23	24.91	22.74	46.32	39.47	0.54	0.85	6.91	0.13	12.99	0.24	30.15	0.43	12.98	1.82
N15	57.72	26.79	24.60	48.92	42.81	0.55	0.88	8.80	0.15	13.98	0.24	38.04	0.37	15.25	1.89
N74	61.91	29.29	26.88	52.32	46.94	0.56	0.90	9.59	0.15	18.36	0.30	48.74	0.38	15.49	1.90
N11	61.80	28.53	26.36	51.24	44.90	0.56	0.88	10.56	0.17	18.40	0.30	46.48	0.40	17.09	1.90
N59	60.16	28.42	26.09	52.07	46.71	0.55	0.90	8.09	0.13	16.60	0.28	44.61	0.37	13.45	1.90
N35	42.46	19.29	17.85	35.29	30.62	0.55	0.87	7.17	0.17	6.33	0.15	14.62	0.43	16.89	1.91
N106	59.02	27.35	25.18	50.60	45.02	0.54	0.89	8.42	0.14	16.59	0.28	40.65	0.41	14.27	1.92
N48	41.60	19.50	18.09	34.43	31.10	0.57	0.90	7.17	0.17	6.85	0.16	14.67	0.47	17.24	1.93

N27	50.44	23.37	21.62	41.95	37.67	0.56	0.90	8.49	0.17	11.52	0.23	25.49	0.45	16.83	1.94
N21	42.43	19.82	18.50	35.02	31.79	0.57	0.91	7.41	0.17	7.16	0.17	15.56	0.46	17.46	1.94
N34	58.60	27.14	24.60	48.56	43.76	0.56	0.90	10.04	0.17	15.75	0.27	39.12	0.40	17.13	1.95
N52	41.59	19.50	18.13	34.32	31.37	0.57	0.91	7.27	0.17	6.63	0.16	14.70	0.45	17.48	1.95
N33	52.31	23.77	21.94	43.35	38.49	0.55	0.89	8.96	0.17	10.43	0.20	27.28	0.38	17.13	1.95
N09	69.05	31.85	29.09	58.00	52.51	0.55	0.91	11.05	0.16	23.63	0.34	63.98	0.37	16.00	1.96
N28	58.78	26.18	24.28	49.31	43.35	0.53	0.88	9.47	0.16	15.28	0.26	37.36	0.41	16.11	1.97
N36	58.18	25.84	24.24	48.35	42.62	0.53	0.88	9.83	0.17	14.25	0.24	36.44	0.39	16.90	1.98
N39	52.75	23.65	21.89	42.96	38.38	0.55	0.89	9.79	0.19	11.91	0.23	27.31	0.44	18.56	1.99
N102	55.42	25.57	23.13	47.05	43.39	0.54	0.92	8.37	0.15	13.89	0.25	32.78	0.42	15.10	2.00
N50	38.47	17.72	16.32	31.28	28.80	0.57	0.92	7.19	0.19	5.27	0.14	11.13	0.47	18.69	2.00
N07	56.18	24.68	22.38	48.41	42.73	0.51	0.88	7.77	0.14	12.43	0.22	31.03	0.40	13.83	2.01
N13	62.56	27.79	26.04	52.97	47.47	0.52	0.90	9.59	0.15	16.74	0.27	45.27	0.37	15.33	2.02
N71	45.71	20.75	18.85	36.73	33.78	0.56	0.92	8.98	0.20	7.12	0.16	17.88	0.40	19.65	2.03
N38	54.14	23.67	21.88	44.64	39.57	0.53	0.89	9.50	0.18	10.97	0.20	28.04	0.39	17.55	2.03
N19	56.34	25.40	24.04	48.18	44.23	0.53	0.92	8.16	0.14	15.31	0.27	34.40	0.45	14.48	2.04
N02	52.90	23.65	21.27	43.35	39.47	0.55	0.91	9.55	0.18	11.67	0.22	26.61	0.44	18.05	2.04
N70	49.88	22.23	20.68	41.31	37.94	0.54	0.92	8.57	0.17	9.51	0.19	22.93	0.41	17.18	2.06
N05	51.96	22.80	20.29	42.24	38.23	0.54	0.91	9.72	0.19	9.81	0.19	24.04	0.41	18.71	2.06
N04	55.28	24.04	22.75	44.91	41.14	0.54	0.92	10.37	0.19	12.78	0.23	30.23	0.42	18.76	2.11
N12	51.67	22.26	20.27	41.13	37.73	0.54	0.92	10.54	0.20	9.12	0.18	23.31	0.39	20.40	2.13
***P. (P.) chindeensis* Form B (28 specimens)**															
N63	59.27	28.67	26.27	52.74	43.82	0.54	0.83	6.53	0.11	17.14	0.29	44.64	0.38	11.02	1.72
N22	40.44	20.07	19.11	36.32	31.00	0.55	0.85	4.12	0.10	7.92	0.20	15.51	0.51	10.19	1.72
N61	51.77	25.07	23.45	44.89	39.17	0.56	0.87	6.88	0.13	12.94	0.25	30.44	0.43	13.29	1.80
N103	62.25	29.06	26.44	52.90	45.28	0.55	0.86	9.35	0.15	17.75	0.29	47.83	0.37	15.02	1.83
N57	57.12	26.41	24.74	49.91	42.42	0.53	0.85	7.21	0.13	16.01	0.28	37.32	0.43	12.62	1.84
N20	45.50	21.78	19.95	37.94	33.41	0.57	0.88	7.56	0.17	8.22	0.18	19.77	0.42	16.62	1.84
N41	51.37	24.24	22.13	45.44	39.49	0.53	0.87	5.93	0.12	12.51	0.24	27.56	0.45	11.54	1.84
N30	57.04	27.13	24.59	50.02	43.84	0.54	0.88	7.02	0.12	16.25	0.28	38.05	0.43	12.31	1.84
N112	52.96	25.16	22.47	43.96	38.68	0.57	0.88	9.00	0.17	12.18	0.23	29.94	0.41	16.99	1.85
N47	45.69	21.80	19.96	38.62	34.22	0.56	0.89	7.07	0.15	8.71	0.19	19.88	0.44	15.47	1.86
N08	51.58	24.49	22.54	44.19	38.98	0.55	0.88	7.39	0.14	12.00	0.23	28.47	0.42	14.33	1.86
N32	58.15	26.92	25.22	50.88	43.79	0.53	0.86	7.27	0.13	16.54	0.28	39.48	0.42	12.50	1.86
N65	56.11	25.87	23.63	47.25	40.66	0.55	0.86	8.86	0.16	13.10	0.23	34.30	0.38	15.79	1.87
N26	46.58	21.46	19.92	40.66	35.05	0.53	0.86	5.92	0.13	8.69	0.19	19.91	0.44	12.71	1.87
N14	56.51	26.40	24.25	48.72	42.75	0.54	0.88	7.79	0.14	13.92	0.25	36.18	0.38	13.79	1.88
N46	39.52	18.47	17.33	32.58	28.63	0.57	0.88	6.94	0.18	5.72	0.14	12.65	0.45	17.56	1.88
N53	51.49	23.90	22.00	43.66	38.28	0.55	0.88	7.83	0.15	11.28	0.22	27.07	0.42	15.21	1.89
N69	56.17	26.47	23.56	49.23	44.22	0.54	0.90	6.94	0.12	14.12	0.25	35.03	0.40	12.36	1.91
N101	54.59	24.51	22.73	45.79	39.31	0.54	0.86	8.80	0.16	12.64	0.23	30.41	0.42	16.12	1.91
N62	65.21	29.39	27.21	55.15	47.53	0.53	0.86	10.06	0.15	20.99	0.32	52.15	0.40	15.43	1.91
N18	50.71	22.72	21.34	43.78	37.69	0.52	0.86	6.93	0.14	10.68	0.21	24.59	0.43	13.67	1.92
N10	49.71	23.53	21.81	41.23	37.53	0.57	0.91	8.48	0.17	11.31	0.23	25.51	0.44	17.06	1.92

N110	50.94	23.34	21.46	44.15	39.23	0.53	0.89	6.79	0.13	10.22	0.20	25.51	0.40	13.33	1.94
N58	63.50	28.46	26.72	56.51	49.18	0.50	0.87	6.99	0.11	18.79	0.30	48.29	0.39	11.01	1.94
N51	48.20	21.62	20.17	37.87	33.17	0.57	0.88	10.33	0.21	8.77	0.18	21.02	0.42	21.43	1.95
N01	53.17	23.16	21.20	43.27	38.06	0.54	0.88	9.90	0.19	10.46	0.20	26.11	0.40	18.62	2.02
N03	48.43	21.00	19.36	39.93	35.20	0.53	0.88	8.50	0.18	8.29	0.17	19.69	0.42	17.55	2.03
N31	44.37	19.58	18.63	36.14	32.88	0.54	0.91	8.23	0.19	7.53	0.17	16.19	0.47	18.55	2.06

Clearing up an Observation Regarding a Predacious Snail – Frog Interaction in Cuba

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The senior author here clarifies a slight miscommunication with the second author, who took the pictures of the snail *Oleacina cyanozoaria* feeding on a *Elutherodactylus* species frog. It seems that Tomás Michel, a member of the field trip where he was in 2013, found the frog in the same spot where the snail was and put the stressed amphibian on its path. However, this event still reflects a potential for opportunistic predatory behavior. The investigational scenario was in fact set in situ with endemic animals of the region, and the *Oleacina* snail indeed fed on the frog and didn't reject it, suggesting that these carnivorous snails could kill those small frogs if if given the chance. We won't discard the idea that these tiny frogs could be in the diet of this aggressive species. We can attest that of all the predatory snails of the island nothing compares in voraciousness with *Oleacina cyanozoaria*. The photos of the paper where the frog is being eaten speak by themselves. A recent report of carnivorous *Ariophanta* and *Macrochlamys* snails eating skins of dead frogs in India (Yadav *et al.*, 2021) show scavenging on dead vertebrates, but our paper shows for the first time the feeding on an alive vertebrate by a terrestrial snail. As we said in our paper, little is known about *Oleacina* species feeding habits, and this paper helps to ascertain it's feeding habits.

LITERATURE CITED:

Adrián González-Guillén, A. and R. López-Silvero. 2021. First Record of *Oleacina cyanozoaria* (Gundlach in Pfeiffer, 1857) Feeding on a *Eleutherodactylus Frog* in Pico San Juan, Cumanayagua, Cienfuegos Province, Cuba. The Festivus 53(4):293-297. https://doi.org/10.54173/F534293

Yadav, O., M. Jadhav, S. Kininge, P. Bajantri, and A. Bhosale. 2021. Land Snails Feeding on Dead Frogs. Reptiles & Amphibians 28(3):546–547. https://doi.org/10.17161/randa.v28i3.15817

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A fossil *Barycypraea*, and one *Bistolida* subspecies, from the Eastern Seaboard of Southern Africa

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ABSTRACT Two Cypreaidae from the Northern Kwazulu-Natal, South Africa, and Southern Mozambique are described. This includes a unique and fascinating fossil cowrie, *Barycypraea iungo*, and a new subspecies, *Bistolida clavicola jangamoensis*.

KEYWORDS *Cypreaidae*, *Barycypraea iungo*, *zietsmani*, Pleistocene, *Bistolida clavicola jangamoensis*, Kwazulu-Natal, Richards Bay, Mozambique and South Africa

INTRODUCTION

The acquisition of an amazing fossil from Richards Bay harbour may represent a potential missing link between other ancestral *Barycypraea*, as well as modern *Barycypraea* and *Zoila*.

A new subspecies of *Bistolida* is described, and positioned in the clavicola group, *Bistolida clavicola jangamoensis*.

ABBREVIATIONS

Coll:	Collection of
NMSA	KwaZulu-Natal Museum, Pietermaritzburg, South Africa
n. sp.	New species
n. ssp.	New subspecies

MATERIAL AND METHODS

Systematics for this paper is based on the work of F. Lorenz's "Cowries A Guide to the Gastropod Family Cypraeidae", published in 2017.

Specimens for Figures 1 and 2, Plate 1 Figures 1-3, Plate 2 Figues 1-3, Plate 3 Figures 1-3, Plate 4 Figures 2-5, and Plate 5 Figure 1 and Figures 3-4, were photographed by Mark Page with a Canon 800D utilizing a dedicated photographic table with adjustable overhead arm. Lenses utilized were a Canon 50 mm and Canon 100 mm Macro lenses. White LED photographic lamps were utilized for lighting with customized, in-camera white balance. Darktable elements were utilized to crop and orientate images.

Images for Plate 4 Figure 1 and Plate 5 Figures 5-6 were supplied for incorporation by A. Seccombe.

SYSTEMATICS

Family Cypraeidae Rafinesque, 1815
Genus *Barycypraea* Schilder, 1927

Barycypraea iungo
Seccombe and Aiken, n. sp.
(Figure 1, Plate 1.1, Plate 2.1, Plate 3.1)

Description. Shell measurements 60.05 x 45.10 mm. Profile humped, broadly pyriform with thick, smooth, rounded margins indented around the shoulder area, with a deeply cut posterior notch. Base (and entire shell) heavily thickened

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and relatively flat. Aperture somewhat broad, columella fairly straight with 16 strong, evenly spaced teeth on the inner edge. Flattened, slightly curved labrum with 18 strong teeth, extending to not quite 50% of the labral width. Anterior canal noticeably short. Distinct presence of round brown spots on the margins. Angular, seemingly uniform brown colour present on the anterior third of the dorsum, and less so surrounding a shallow plain mid-dorsal area. Dorsal surface bears two distinct tubercles in the posterior third of the specimen, on either side of the mid-dorsal line. Combined with a ridge at the peak of the hump, this creates the smooth, apparently colourless mid-dorsal window. Faint, small but clear patches of gloss still cover the shell surface.

Figure 1. *Barycypraea iungo* Seccombe and Aiken, n. sp.

Type Material. The type material of the holotype of *B. iungo* is as follows:
Holotype: 60.05 x 45.10 mm. (Plate 1.1). Coll: NMSA-Mol 0P2009/T4560, Donated by A. Seccombe.

Distribution. Beach collected after a break up of fossil banks beds, in Richards Bay for harbour expansion.

Etymology. iungo, after the Latin verb for join, connect, yoke or bridge.

Observations re color. Its sporadic black colouring is most likely influenced by the inclusion of Titanium ore, ilmenite and rutile, plentiful in the sands of the Richards Bay area.

DISCUSSION

Originally identified as an old dead *B. fultoni* (Sowerby III, 1903), on close inspection it represents a truly amazing find. The specimen seems to combine characteristics of *B. zietsmani* Liltved & Le Roux, 1988 (Plate 1.2), in the south, around Port Elizabeth, as well as members of this Genus to the north, at Java, such as *B. caputviperae* Martin, 1899 and *B. caputavisensis* Beets, 1987. Although Beets, in 1987, in naming *caputavisensis*, felt that it was a predecessor to *Zoila*, he seemed to overlook its potential connection with Barycypraea. Lorenz, in his superb recent works on Cypraea, spends some time introducing this Genus, and, tellingly, while keeping *Barycypraea* over *Afrozoila*, he most importantly recognizes some common morphology between Javan fossils and extant species such as *B. teuleri* Cazenavette, 1846 and *B. fultoni* (Sowerby III, 1903) (Plate 2 fig. 1-2). The Richards Bay fossil has classic dorsal knobs much like *zietsmani*, but a strong set of columellar teeth, non-existent in *zietsmani*, but way more like the *caputavisensis* illustrated by Lorenz. Lorenz, already in Schriften zur

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Malakozoologie 4, 1991, pays quite some attention to the development of *Barycypraea*, producing detailed hand drawn illustrations of the posterior tubercles in older members, to *B. luxuriosa* Schilder 1939, where the tubercle development becomes extreme. Although larger, *B. iungo* bears a strong resemblance also, to *B. murisimilis* (K. Martin, 1879) (Plate 1.3) in morphology and dentition. See Lorenz Plate 335 Vol 2, shell #1. The possible likeness to the American *Muracypraea* (such as *heneckeni*), may be coincidental, as Lorenz feels that *Muracypraea* may bear resemblance to *Barycypraea* as a matter of convergence rather than a phylogenetic relationship.

The Pleistocene beds around Zwartkops, Port Elizabeth, also exist in the area around Richards Bay in Northern KZN. (Johan Marais, personal communication).

Could it be that the southern *B. fultoni fultoni* (Plate 2.2) is derived from *zietsmani*, with its noticeable paucity of columellar dentition? The second author has referred to these as nodules, rather than teeth. Their number can be as low as 7 only. *B. iungo* seems to give rise to the *B. amorimi* group (Plate 3 Figures 2-3), off southern Mozambique, that exhibit multiple columella teeth, and the extreme *B. amorimi* (Plate 3 Figure 2) shape with produced marginal calluses.

So, it would seem that *B. iungo* is the first real clue that hints of a past yolking of ancient *Barycypraea*.

SYSTEMATICS
Family Cypraeidae Rafinesque, 1815
Genus *Bistolida* Cossmann, 1920

Bistolida clavicola jangamoensis
Aiken and Seccombe, n. ssp.
(Figure 2, Plate 4, Plate 5 Figures 1-3)

Description. Shell size somewhat variable, ranging from 23 mm to 32 mm. Shells solid, narrow-oval, with extended extremities, creating a rostrate appearance. Posterior terminal blotched on either side, with strong double blotch on each of the produced margins. These are in line with the dorsal blotch. Large dark brown dorsal blotch with few lacunae. Dorsal blotch only rarely connected to marginal blotches. Marginal spotting fine. Dorsal profile flattened, base of shells with relatively narrow aperture, columellar side with teeth extending onto the base only in the posterior half. Labral side has strong teeth that effectively come across the entire base. Background colour olive-grey.

Type material. The type material of the holotype and paratypes of *B. clavicola jangamoensis* are as follows:

Holotype: 23.3 x14.9 mm. (Figure 2), Jangamo, Mozambique. NMSA Mol 0M0585/T4561. Donated by R. Aiken.
Paratype 1: 28.1 mm. (Plate 4.1), Jangamo, Mozambique. Coll: A. Seccombe.
Paratype 2: 29.3 x 17.0 mm. (Plate 4.2), Snorkel, Jangamo, 1973. Coll: R. Aiken.
Paratype 3: 26 mm. Coll: (Plate 5.2), A. Seccombe
Paratype 4: 28.1 mm. Coll: A. Seccombe
Paratype 5: 22.4 x 12.7 mm. (Plate 4.3), Sodwana Bay, SCUBA, 30 m. Coll: R. Aiken.
Paratype 6: 21.6 x 15.7 mm. (Plate 4.5), Jangamo, Mozambique. Coll: R. Aiken.
Paratype 7: 31.9 x 19.3 mm. (Plate 4.4), Jangamo, Mozambique. Coll: R. Aiken.
Paratype 8: 24.7 x 14.7 mm. (Plate 5.1), Inhambane, Southern Mozambique. Coll: R. Aiken.
Paratype 9: 27.8 x 16.0 mm. (Plate 5.3), Port Durnford, Kwazulu-Natal. Coll: R. Aiken.
Paratype 10: 25.1 x 15.4 mm. Jangamo, Mozambique. Coll: R. Aiken.
Paratype 11: 25.3 x 14.4 mm Jangamo, Mozambique. Coll: R. Aiken.

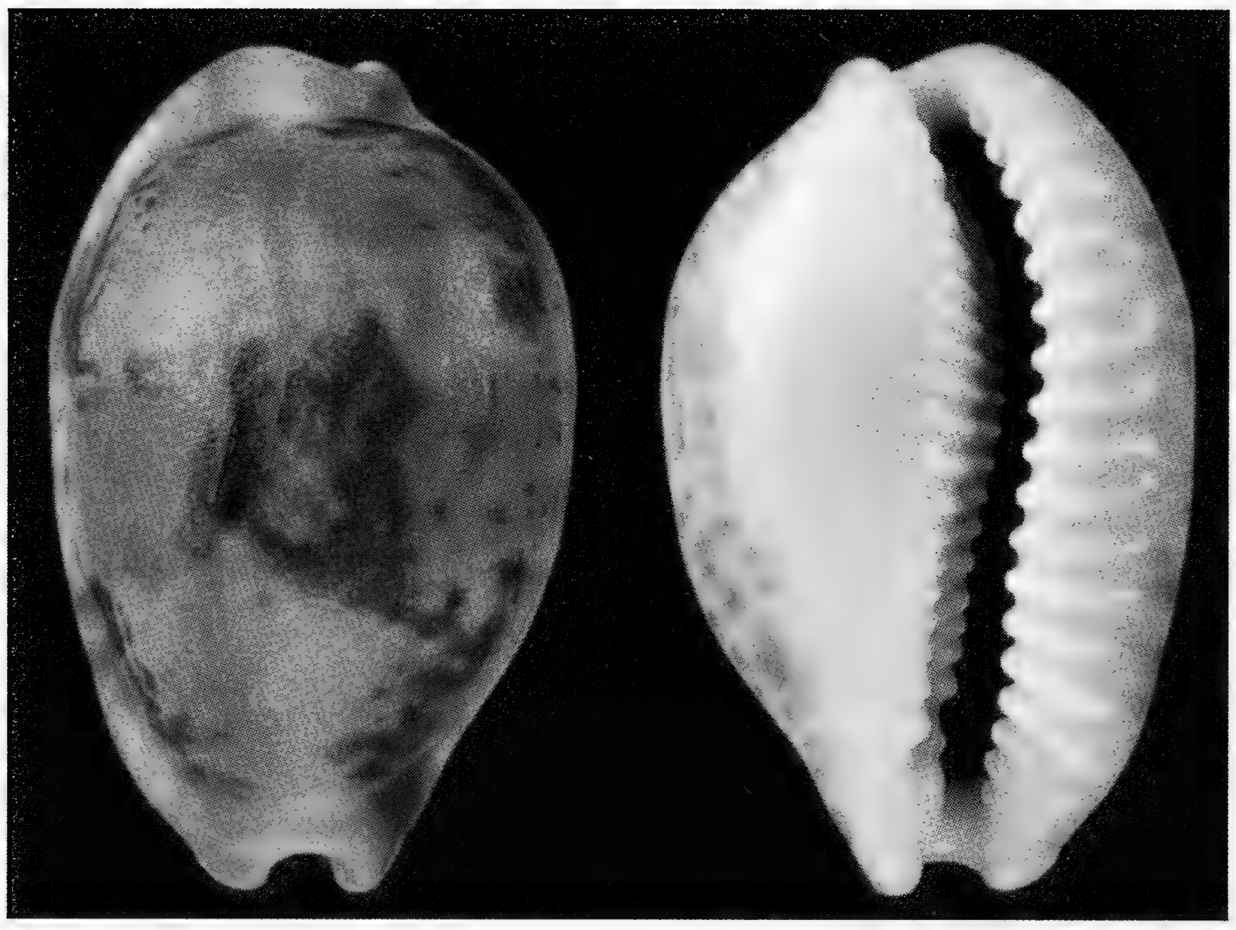

Figure 2. *Bistolida clavicola jangamoensis* Aiken and Seccombe, n. ssp.

Distribution. In shallow water from Inhambane, Southern Mozambique, southwards to at least Kosi Bay / Port Durnford / Sodwana, with a seeming concentration in the Jangamo reef area, Southern Mozambique.

Etymology. Named after the pretty horseshoe reef at Jangamo, Southern Mozambique.

DISCUSSION

This more southern subspecies of *B. clavicola* came to the attention of the second author fairly recently. The more northern *B. clavicola clavicola* Lorenz, 1998 (Plate 5, fig 4) has a blue-grey background, is markedly oval, and has shorter extremities. Although uncommonly available as "*B. diauges uvongoensis* Massier, 2004", these shells are also not like the true *uvongoensis* type specimens shown by Massier, and belong more in the *clavicola* group, not *diauges*. They fit the *clavicola* profile, being more oval, profile flattened, teeth configuration like *clavicola*, (very short on anterior of columella), and have an olive-grey background, as opposed to Massier's 'olive-beige', and Lorenz pale orange for *uvongoensis*. *B. diauges uvongoensis* (Plate 5 fig 5-6) is a more elongate shell.

In 2005, Ronnie Watt produced a comprehensive dissertation on the *Bistolida* complex. In it, he mentions "integrades between *diauges* and *clavicola*" off East Africa. (PL 24.) Lorenz, however, in 2017 maintains that there is always a distinction between the two, even when found sympatrically. The Watt 'integrades' are *B. clavicola jangamoensis*, with their more oval profile and olive-grey background.

ACKNOWLEDGEMENTS

We thank Mark Page for photography of images, collation of photos, proof reading and layout, Johan 'Smiley' Marais, for advice on Fossil history in Richards Bay, and, Elodie Heyns-Veale for kindly supplying museum accession numbers.

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Cite as:Aiken, R., and A. Seccombe. 2022. A fossil *Barycypraea*, and one *Bistolida* subspecies, from the Eastern Seaboard of Southern Africa. The Festivus 54(2):101-109.
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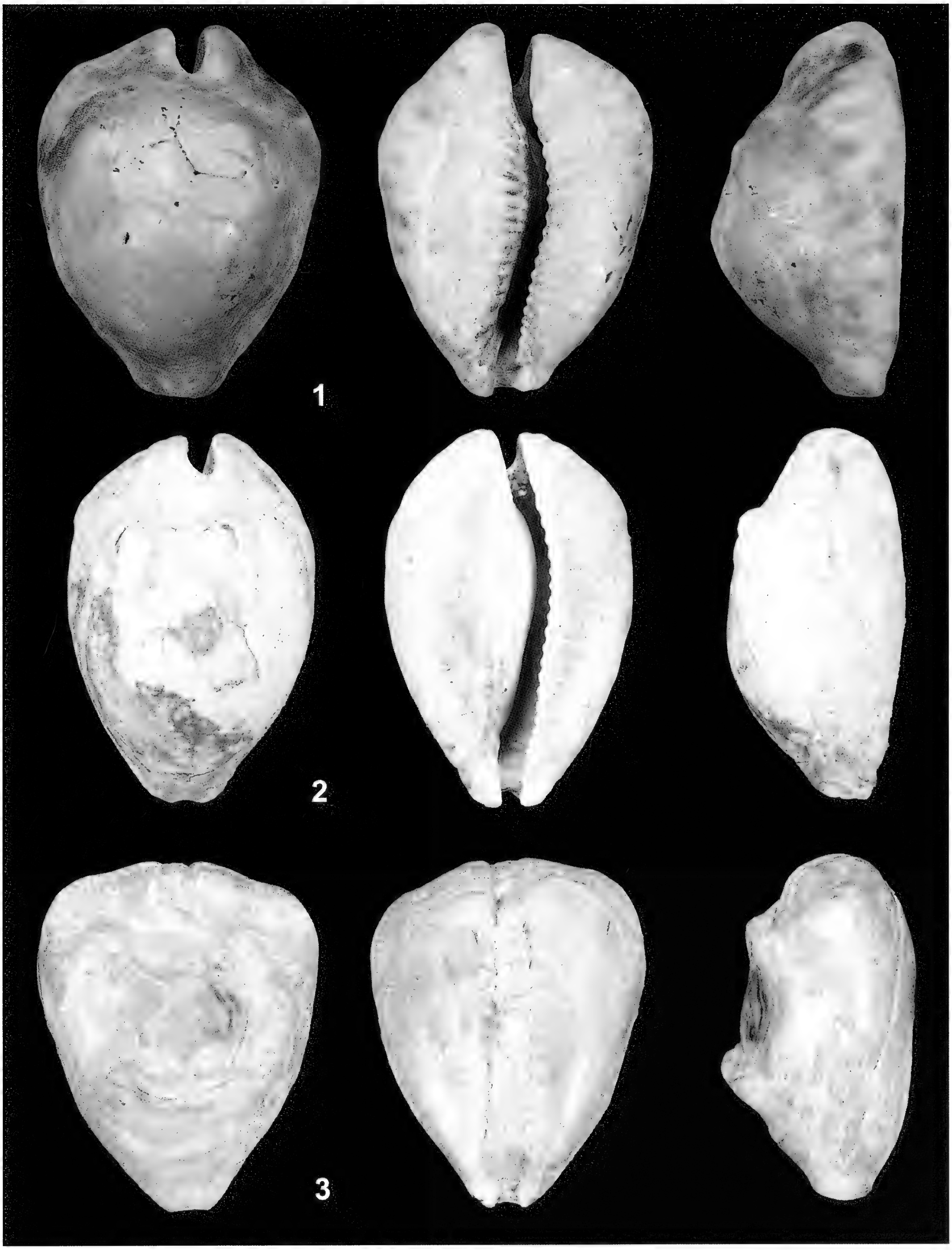

Plate 1. **1** = *Barycypraea iungo* (60.05 x 45.10 mm) – Holotype; fossil banks beds, Richards Bay, Kwazulu-Natal. Coll: A. Seccombe. **2** = *Barycypraea zietsmani* (69.2 x 43.9 mm); Eastern Cape. Coll: R. Aiken. **3** = *Barycypraea murisimilis* (41.4 x 33.1 mm); Nyalindung, Java Is. Coll: R. Aiken.

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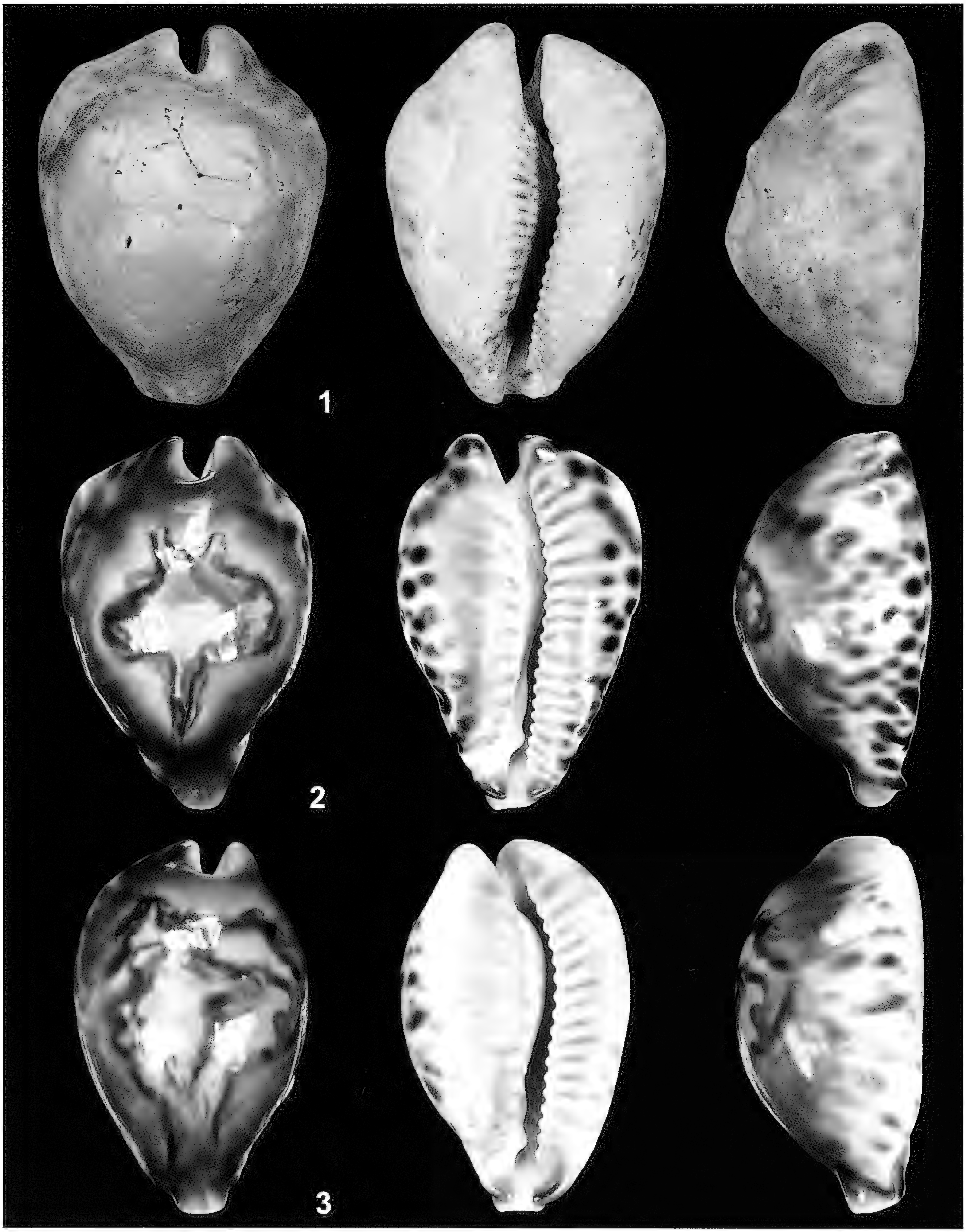

Plate 2. **1** = *Barycypraea iungo* (60.05 x 45.10 mm) – Holotype; fossil banks beds, Richards Bay, Kwazulu-Natal. Coll: A. Seccombe. **2** = *Barycypraea fultoni fultoni* (66.5 x 44.7 mm); 75 metres, Off Southern Kwazulu-Natal. Coll: R. Aiken. **3** = *Barycypraea fultoni fultoni* [*miniatra*] (55.2 x 34.5 mm); Southern Kwazulu-Natal. Coll: R. Aiken.

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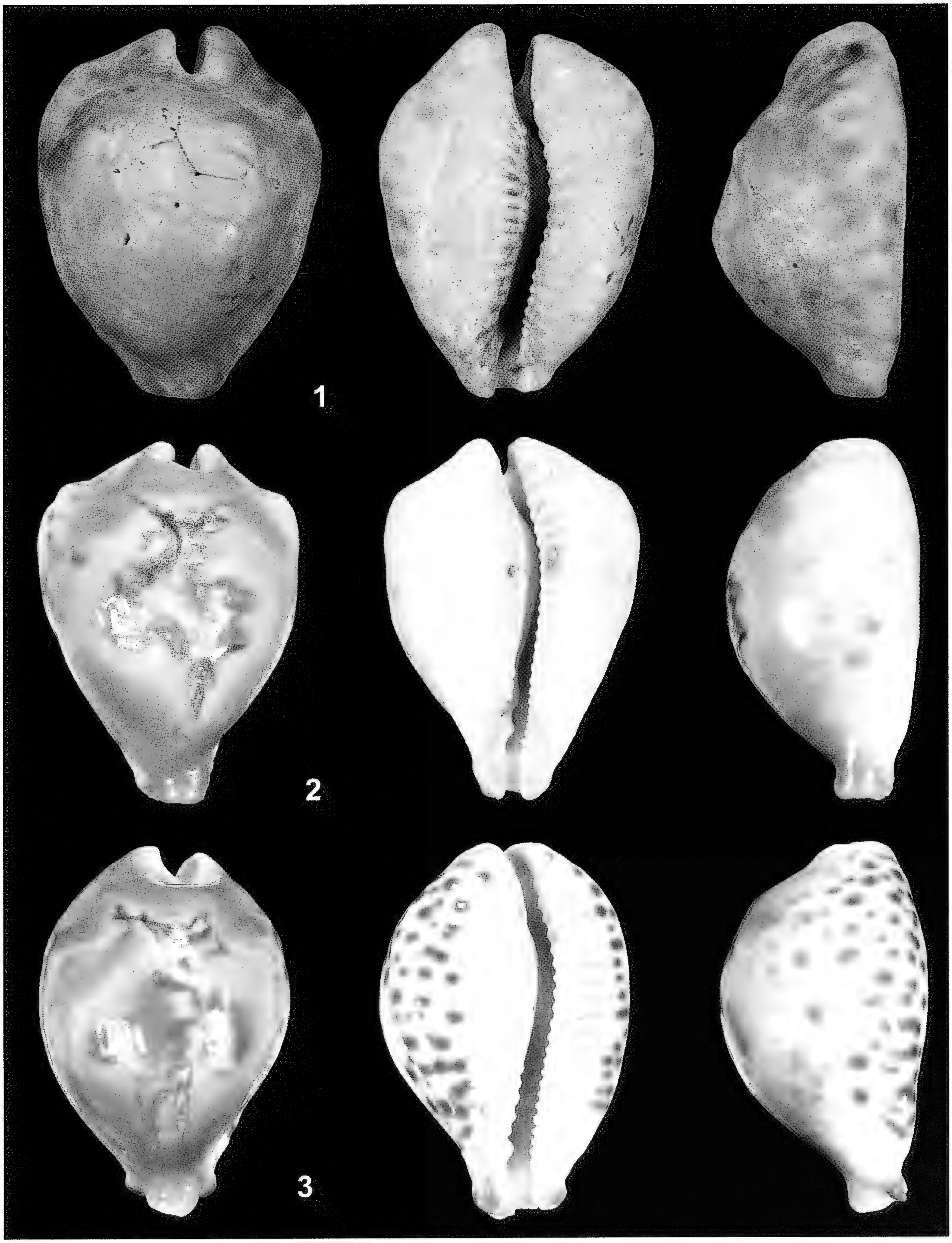

Plate 3. **1** = *Barycypraea iungo* (60.05 x 45.10 mm) – Holotype; fossil banks beds, Richards Bay, Kwazulu-Natal. Coll: A. Seccombe. **2** = *Barycypraea fultoni amorimi* (72.4 x 52.8 mm); Mozambique. Coll: R. Aiken. **3** = *Barycypraea fultoni amorimi* [*mozambicana*] (73.2 x 48.8 mm); Mozambique. Coll: R. Aiken.

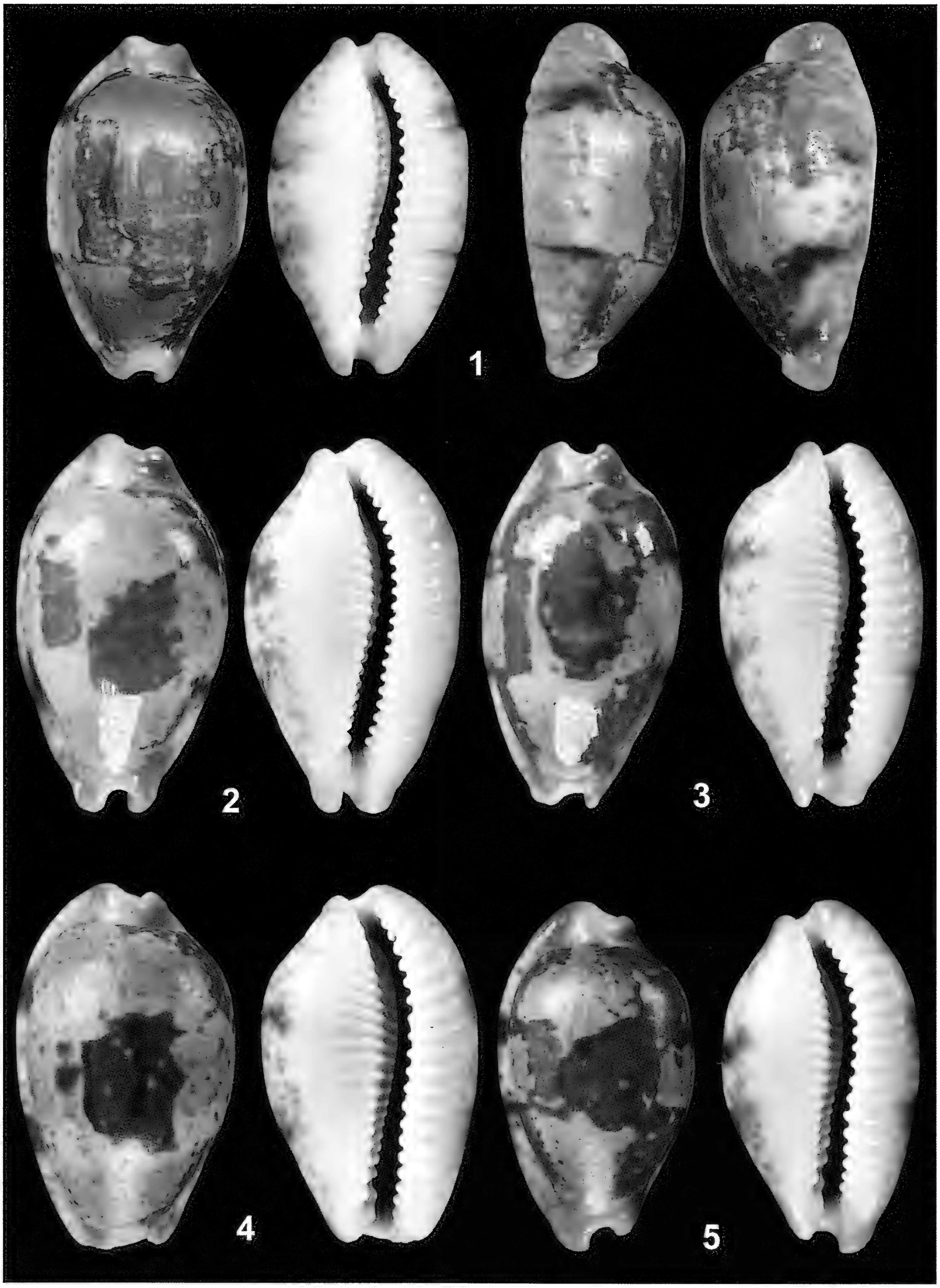

Plate 4. **1** = *Bistolida clavicola jangamoensis* (28.1 mm) – Paratype 1; Inhambane, Southern Mozambique. Coll: A. Seccombe. **2** = *Bistolida clavicola jangamoensis* (29.3 x 17 mm) – Paratype 2; Jangamo Beach, Snorkel, Southern Mozambique. Coll: R. Aiken. **3** = *Bistolida clavicola jangamoensis* (22.4 x 12.7 mm) – Paratype 5; Scuba - 30 m, Sodwana Bay, South Africa. Coll: R. Aiken. **4** = *Bistolida clavicola jangamoensis* (31.9 x 19.3 mm) – Paratype 7; Jangamo, Southern Mozambique. Coll: R. Aiken. **5** = *Bistolida clavicola jangamoensis* (21.6 x 15.7 mm) – Paratype 6; Jangamo, Southern Mozambique. Coll: R. Aiken.

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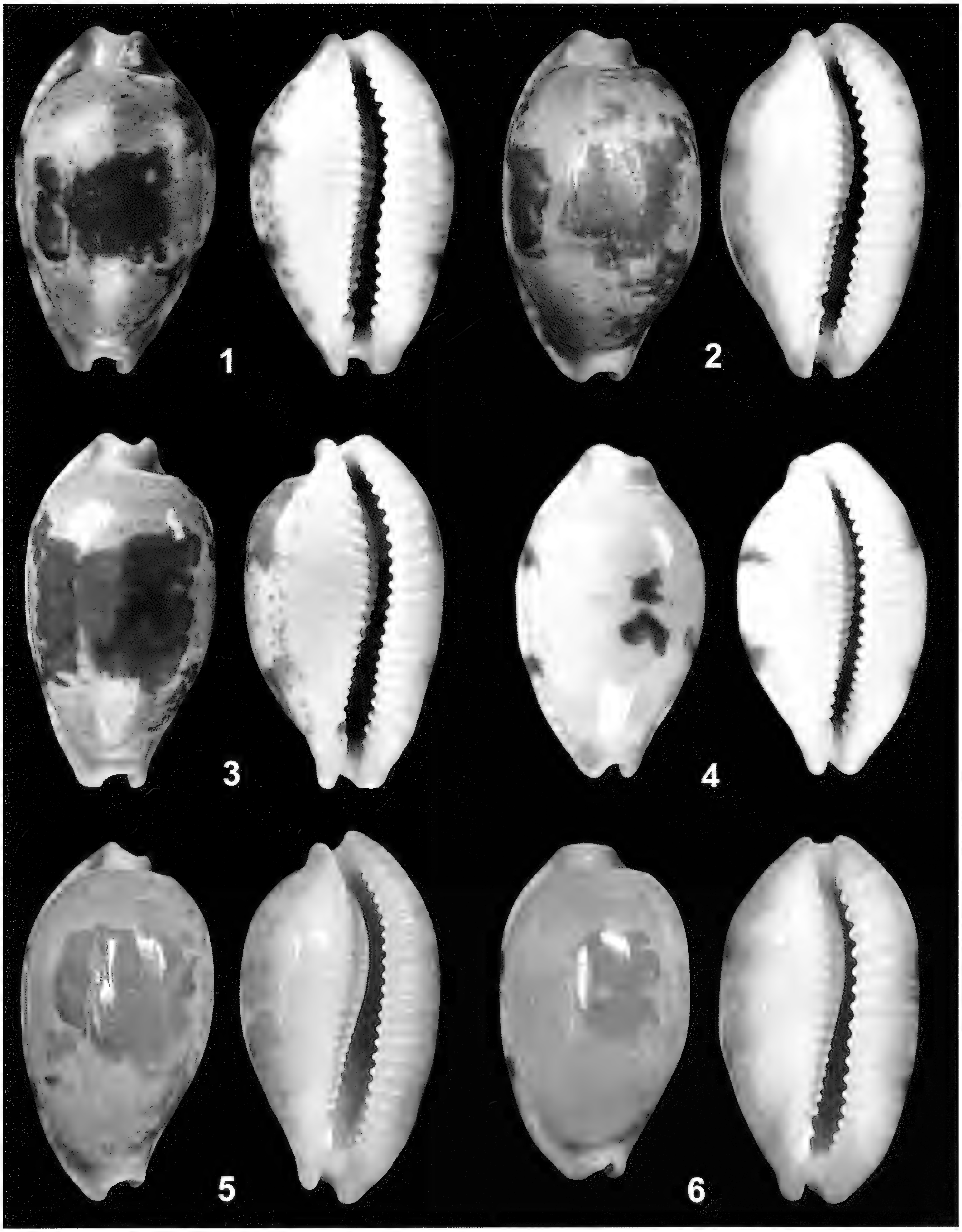

Plate 5. **1** = *Bistolida clavicola jangamoensis* (24.7 x 14.7 mm) – Paratype 8; Inhambane, Southern Mozambique. Coll: R. Aiken. **2** = *Bistolida clavicola jangamoensis* (26.0 mm) – Paratype 3; Inhambane, Southern Mozambique. Coll: A. Seccombe. **3** = *Bistolida clavicola jangamoensis* (27.8 x 16.0 mm) – Paratype 9; Port Durnford, Kwazulu-Natal. Coll: R. Aiken. **4** = *Bistolida clavicola clavicola* (22.9 x 13.3 mm); Kikambala, Kenya. Coll: R. Aiken. **5** = *Bistolida diauges uvongoensis* (29.5 mm); Pumula, Kwazulu-Natal. Coll: A. Seccombe. **6** = *Bistolida diauges uvongoensis* (27.5 mm); Kwazulu-Natal. Coll: A. Seccombe.

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Iridescence in land snails

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ABSTRACT For the first time, 14 genera of land snails that contain individuals who display iridescence on either the animal and/or shell are identified. This phenomenon has not been previously reported in the malacological literature. The biological significance of iridescence among these snails is currently unknown.

KEY WORDS Iridescence, land snails.

INTRODUCTION

Iridescence is often described as a phenomenon of particular surfaces that appear to switch color as the angle of view or illumination changes. It generates a wide range of color that may extend from violet to red and the visible light spectrum between. A wide range of plants and animals exhibit iridescence, which may serve a variety of biological functions, or the occurrence may simply be a serendipitous based on surface structure. Bioluminescence on the other hand is just light generated by animals or plants via a chemical reaction and is not a reflection.

Invertebrates employ all kinds of optical trickery to become themselves either unseen or conspicuous to predators. Somehow, those conspicuous strategies seem to work perfectly under certain scenarios, *e.g.*, cephalopods neural control readjusting their iridescence responsible protein structures in order to match their surroundings. Evolution of the optical effect of iridescence is related to several developed structures in the mineral, animal and plant kingdoms.

Pigmentary colours are generated by the selective absorption of some wavelengths by special molecules called pigments (which do not emerge by reflection or transmission) while *structural colours* are generated by the physical interaction of light with matter, causing dispersion, diffraction or interference (*e.g.*, coleopteran elytra cuticle contour). Among structural colours, iridescent colours change depending on the illumination or observation viewpoint. They can be produced by interferences of light after reflection by a thin-film or multilayer structure, or diffraction on a grating (Gruson *et al.* 2019; Hariyama *et al.* 2002). Therefore, the study of the evolution of iridescent colours requires a precise quantification of the angular dependency. The iridescence versatility versus pigment-based signaling could be mainly related to few or a myriad of processes in animals' visual communication (White 2018).

Despite being not so uncommon in nature (*e.g.*, fishes, birds, reptiles, arthropods, etc.), iridescence seems to be infrequent in land snails [bioluminescence is even rarer, with still only one known species *Dyakia (Quantula) striata* (Gray, 1834)]. The iridescence of snails could

be related to the animal's mantle, shell "mirror reflection" and layered crystal structures deposited in the animal tract and lung veins (*e.g.*, guanine crystals).

During malacological photographic field expeditions in Ecuador between 2008-2012 we observed few land snails' species from mountain moist cloud forests which under intense flash light reflected pearly white, light green and bright red flecks or dots. Years later during an eastern Cuban land snail photoshoot in 2019 we came across a similar type of iridescent reflection seeing in the apical whorls of one common Cuban species that mainly inhabit central-eastern part of the archipelago.

We did a search on Internet and examine literature at hand in order to determine which snails could be considered as displaying iridescence. So, many of the mentioned species were found by pictures on several websites and some photos were kindly given to us by the photographers.

DISCUSSION

Pigmentary color in snails are common, sometimes the animals body are distinctive, *e.g.*, *Platymma tweediei* (Tomlin, 1938). Sometimes the shells with its bright coloration steals all the protagonism, *e.g.*, *Polymita*, *Liguus*, *Asperitas*, and *Amphidromus*. On the other hand, iridescence seems to be an uncommon trait in land snails.

Iridescence in land snails is exhibited in two forms: 1) smooth, lustrous, helicoid, depressed or elongated translucent shells that could reflect iridescent shades in the shell or through it; and, 2) animals with reflective living tissue coloration with translucent or opaque shells. Sometimes iridescence in land snails are a combination of how translucent is the shell is and how reflective turns the animal pigmentation underneath in front of different light concentrations.

Land snails found with iridescent reflection in its shells:

- *Phaulocystis iris* (Muratov, Abdou & Bouchet, 2005). Locality: Mayotte, Mlima Tchaourembo, Comores Islands, Mozambique. Shell pale-corneus brownish with spiral riblets. Its radial, extremely compressed sculpture "*produces an iridescent effect*" (source: scientific paper).
- *Drepanostomella nautiliforme* (Porro, 1836). Locality: Northern Ecuador. Slight iridescent golden reflection in its helicoid shell.
- *Tamayoa decolorata* (Drouët, 1859). Locality: French Guiana, also introduced in other Caribbean islands (*i.e.*, Guadeloupe). The bright yellow specimens seem to reflect a slight iridescent golden reflection through its semi-translucent helicoid shell when alive.
- Species unknown. Locality: Delos Mountain, Papua-New Guinea. Slight iridescent golden reflection in its nautiliform shell (source: internet photo in Flickr by Robert Lasley).
- *Proserpina depresa* (D'Orbigny, 1842). (Plate 1, Fig. 4) Locality: Cuba. Slight iridescent golden reflection in its helicoid shell.
- *Proserpina globulosa* (D'Orbigny, 1842). Locality: Cuba. Slight iridescent green reflection in its helicoid shell.
- Species unknown (Helicarionidae?). (Plate 1, Fig. 2) Locality: North Ecuador. Dark green-bluish iridescent reflection in its helicoid shell.
- *Kalidos* sp. (Helicarionidae). Locality: Northern Madagascar. Dark green-brownish iridescent reflection in its helicoid shell.
- *Oleacina* spp. Locality: Caribbean. *Oleacina* carnivorous snails exhibit translucent amber-yellow shells with orange to bright yellow animals, which depending of the light angle can surface a yellowish metallic iridescence.
- Species unknown (Helicarionidae). Costa Rica. Sort of blue metallic reflection from shell…seems

like animal internal organs (source: photo by Ira Richling).

- *Helicarion cuvieri* (Férussac, 1821). Victoria and Southern New South Wales in Australia and Tasmania. The red form of this semislug species got a sort of red metallic reflection on its shell.

Remarks: Additional species from *Happia*, *Hapiella*, *Tamayoa* and other genera (*i.e*, Helicarionidae family) must be examined alive to see if its shells expose iridescence as well.

Land molluscs found with some iridescence degree in their animal's body:

- *Synapterpes bicingulatus* (Fulton, 1908). (Plate 1. Fig.5) Locality: Northern Ecuador. Pearly iridescence in its whorls.
- *Euclastaria euclasta* (Shuttleworth, 1852). (Plate 1. Fig.1) Locality: Charrascales de Mícara, Santiago de Cuba. Green iridescence in its apex first whorls. In this locality among ophiolites is common to find metals such as cadmium, chrome and nickel.
- *Plekocheilus* sp. (juvenile). Locality: Laurel, Carchi, Ecuador. Bright red iridescence in its lung veins.
- Species unknown (Scolodonta?). (Plate 1. Fig. 6) Locality: La Bonita, Ecuador. Golden reflection and bright green specks through all the whorls.
- *Ubiquitarion iridis* (Hyman, 2007) [syn. *Peloparion iridis*]. Locality: Brooyar State Forest, Somerset Dam and Mt Glorious in South East Queensland. An iridescent semi-slug of pink-brownish coloration.
- Species unknown. (Plate 2, Fig. 8) Locality: Sri Lanka or Andaman Islands. Light blue-green iridescent slug (from a 2009 photo published in 2010 by Californian rare books librarian Katharine Donahue).
- *Ibycus rachelae* (Schilthuizen & Liew, 2008). (Plate 1, Fig. 3) Locality: Borneo and Sabah semi-slug, Indonesia. Also found in Raub, Pahang, Malasya. Bright green and yellow phosphorescent type of coloration in mantle that creates an iridescence sensation.
- *Satiella* sp. [*Satiella* (Blanford & Godwin-Austen, 1908) seem to contain interesting species]. Locality: Western Ghats, India. Both, the animal and the shell show iridescent reflections.
- *Gaeotis nigrolineata* (Shuttletvorth, 1854). (Plate 2, Figs. 5-6) Locality: Different locations from El Yunque National Forest in Porto Rico. This one and the other "named" species in this genus [*albopunctulata* (Shuttletvorth, 1854), *malleata* (Pilsbry, 1899), *flavolineata* (Shuttletvorth, 1901)] display in its transparent body bright green and yellow phosphorescent type of coloration in mantle, which depending on the light angle creates an iridescent sensation. It seems that all the species are in fact a single one (Genaro & Sánchez, 2019: 137, 142).
- *Drymaeus binominis* (Guppy, 1868) or (E. A. Smith, 1895). Locality: Saint Vincent and other Lesser Antilles Islands. Caribbean bluish-bodied *Drymaeus* usually display not so translucent shells, but this species exhibits a noticeable bluish iridescence.
- *Drymaeus sallei* (Pilsbry, 1899). Locality: Dominican Republic. Bluish iridescence in the animal.
- *Drymaeus laticinctus* (Guppy, 1868). Locality: Dominica. This species displays beautiful shells that can be bright sulphur yellow or red with dark bands. Its animal on the other hand is blue with translucent yellow tentacles displaying in occasions iridescence.
- *Drymaeus sulphureus* (Pfeiffer, 1857). Locality: Central America (e.g., Belize) and Lesser Antilles (*e.g.*, Dominica). Bluish iridescence in the animal.
- *Drymaeus valentini* (Breure & Vega-Luz, 2020). (Plate 2, Fig. 2) Locality: Iquitos, Peruvian Amazon region. Animal with particular light blue-green iridescence.
-*Drymaeus sp.* Locality: Manzanares, Caldas, Colombia (picture by Jorge Eduardo Bernal Quintero). Bluish iridescence in the animal.
- *Bielzia coerulans* (Bielz, 1851). Locality: Carpathian area in Europe. Slug with blue iridescent reflection.

- *Triboniophorus graeffei* (Humbert, 1863). East Australia. In this wide-ranging colored species, the greenish and light blue color forms could reflect slight iridescence.

Remarks: Other small snails with shining smooth shells displaying noteworthy translucent bright colorations in their bodies such as Jamaican *Proserpina pisum* (Adams, C. B., 1850) (Plate 2, Fig. 3) or *Happia decolorata* (Drouët, H., 1859) need more scrutiny.

CONCLUSIONS

A somewhat metallic iridescence occurs in smooth helicoid shells among different species seemingly occur across the globe. It appears that this type of shell iridescence is the most frequent in land molluscs. Land shells with elongated shape, periostracum "hairs", pronounced ribs and spines seem less likely to be iridescent. The existence of transparent or slightly translucent shells with animals of vivid or contrasting colors doesn't mean a certainty of iridescent flakes finding. In many cases, the remarkable animal body color may look different through its semi-translucent or semi-opaque shells, *e.g.*, Cuban *Cysticopsis lassevillei* (Gundlach in Pfeiffer, 1861) (Plate 2, Fig. 4), and probably the Hispaniolan *Helicina* cf. *viridis* (Lamarck, 1799 and 1822) (Plate 2, Fig. 1), Indonesian *Rhinocochlis nasuta* (Thiele, 1931) (Plate 2, Fig. 7), and Indian *Euplecta* sp. (Ariophantidae). In fact, only a very small fraction of the species with translucent shells we know could display iridescent specks.

In our review of land snails, we might have misunderstood some iridescence with certain bright colors reflection (*i.e.*, *Gaeotis* species, unidentified Ecuadorian mollusk, etc.). Snails with semi-translucent shells displaying bright-colored organs sometimes nearly "photo-sensitives" or phosphorescent [*e.g.*, *Simpulopsis citrinovitrea* (Moricand, 1836), *Habroconus cassiquiensis* (Newcomb, 1853), *Simpulopsis corrugata* (Guppy, 1866)] not necessarily must be considered as iridescent.

Guanine crystals could be one of the sources of iridescence in some land snails' digestive tract, lung veins, or any other organ in its anatomy. However, the animals that reflect iridescence in their foot, head and tentacles seem to have another explanation.

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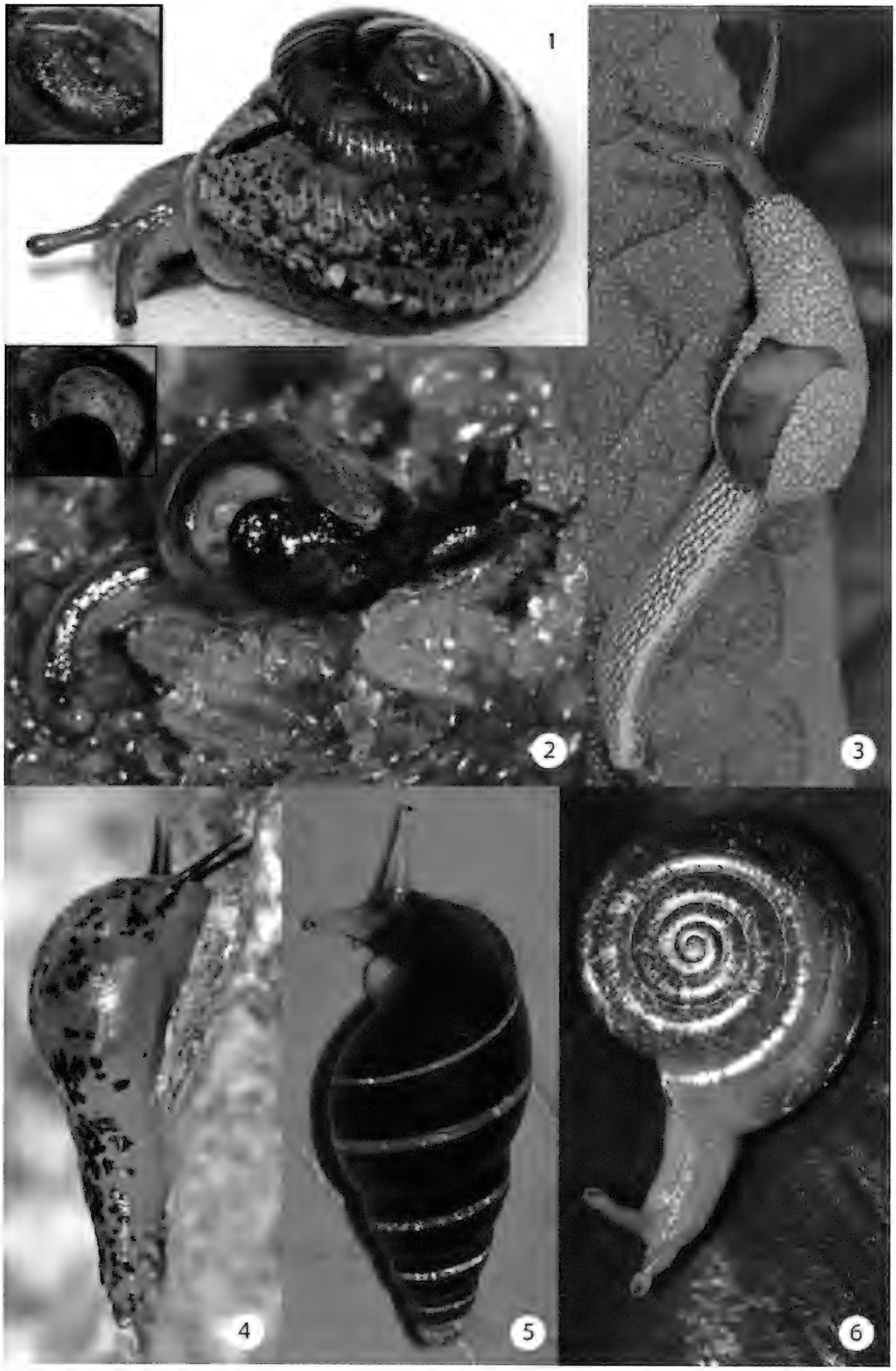

Plate 1. **1**= *Euclastaria euclasta*. Charrascales de Mícara, Santiago de Cuba province. **2**= Species unknown (Helicarionidae?). North Ecuador. **3**= *Ibycus rachelae*. Malasya. **4**= *Proserpina depresa*. Sierra de los Órganos, western Cuba. **5**= *Synapterpes bicingulatus*. Nanegalito, Ecuador. **6**= Species unknown (*Scolodonta*?). La Bonita, North Ecuador. Picture credits: #2 Courtesy of Francisco Tobar. #3 Arnold Wijker (inaturalist.org). # 1, 4-6 Adrián González-Guillén.

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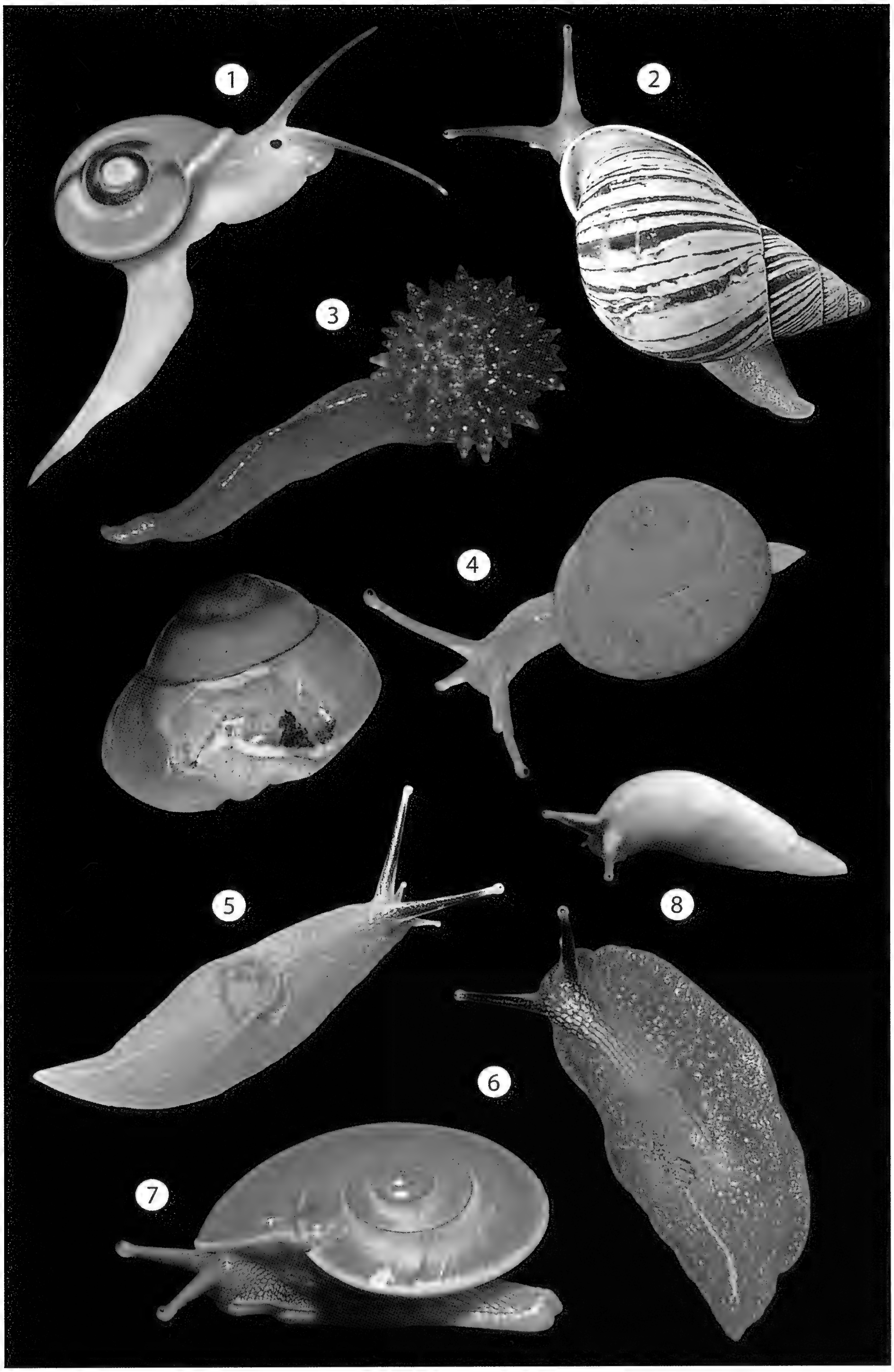

Plate 2. 1= *Helicina viridis*. Dominican Republic. **2**= *Drymaeus valentini*. Iquitos, Amazonian Peru. **3**= *Proserpina pisum*. Jamaica. **4**= *Cysticopsis lassevillei*. Pico La Bayamesa, Santiago de Cuba province. **5 & 6**= *Gaeotis flavolineata*. Rio Grande vicinity, Yunque national forest, Porto Rico. **7**= *Rhinocochlis nasuta*. Serian, Sarawak, Malasya. Picture credits: #1 Courtesy of Carlos de Soto Molinari. #2 Courtesy of Víctor Castillo Villanueva. #3 Courtesy of Simon Aiken. #4 Adrián González-Guillén. #5 ianprincecordero (inaturalist.ca). #6 Tom Kennedy (inaturalist.ca). #7 danolsen (inaturalist.uk).

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An iconography of *Ministrombus* Dekkers, 2010 (Gastropoda: Neostromboidae: Strombidae) with the description of new species

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ABSTRACT This iconography explores the variability and ranges of members of the *Ministrombus* and introduces three new species bringing the total to six in the genus. Two of these species are alluded to in previous works but were never described. *M. athenius* is recircumscribed and the type locality is shifted to reflect this change in taxonomic position. This paper examined 430 specimens, and used morphology and distribution patterns to delineate species. There is considerable variability in the form of each species; however, within each species complex, there are distinctive characteristics that enable taxonomic resolution. This paper adds to the growing understanding of diversity within Neostromboidae, and highlights the revisions of what are currently considered stable taxa increasing our understanding of global biodiversity.

KEYWORDS Indonesia, Marshall Islands, New species, New Caledonia, Queensland, *Strombus*

INTRODUCTION

Stromboideans are a diverse group of marine snails that have undergone a renaissance in taxonomy with many new revisions in its internal composition and higher taxonomic relationships (Maxwell *et al.* 2019, 2020a, 2020b; Dekkers and Maxwell 2020; Maxwell and Dekkers 2021a, 2021b). However, while these revisions have led to greater clarity in the understanding of internal evolutionary relationships, many of the genera contained within the complex are still in need of revision given the increasing availability of comparative material, more nuanced understanding of distributions and access to type material.

The *Ministrombus* Dekkers, 2010 are a group of small to medium sized stromboideans that are restricted to the Central Indo-Pacific region. Once considered members of the *Dolomena*, *Ministrombus minimus* (Linné, 1771) was the first to be placed in *Ministrombus* by Bandel (2007), although there are some problems with the construction of that genus and it is not compliant with the ICZN, nor is it defined under the PhyloCode (Dekkers and Maxwell 2020; Maxwell 2021). Unintentionally, while Dekkers (2010) accepted Bandel (2007), the author addressed this taxonomic issue, and it is Dekkers (2010) work that is ICZN compliant, and which is registered into the RegNum of the PhyloCode (Maxwell 2021). Furthermore, it was Dekkers (2010) that included *M. variabilis* (Swainson, 1820) in *Ministrombus*.

At present there are three recognised species within *Ministrombus*; *M. athenius* (Duclos in Chenu, 1844), *M. minimus* and *M. variabilis*, with earlier workers hinting that there are more undescribed species hiding within the species complexes (Abbott, 1960). This iconography explores the current taxonomic status and variability of members of *Ministrombus* and seeks to determine a more nuanced understanding of morphological diversity and species composition within the genus.

Abbreviations

SBRF BlueSky Research Foundation, Cairns, Queensland.
SMC Stephen Maxwell Collection, Cairns, Queensland.
YC Trevor and Marguerite Young Collection, Townsville, Queensland.
VC Valda Cantamessa Collection, Proserpine, Queensland.
VLC Virgillio Liverani Collection, Faenza, Italy.

METHODS

This study examines specimens from the combined range of the current species contained within *Ministrombus* Dekkers, 2010. Type material and type locations for currently accepted species and their synonyms were identified (Figure 1). Based on this type information, the current taxonomy was explored, and any inconsistency or errors in the current nomenclature were identified and corrected. Organisms that fell outside currently described species morphometric bounds were identified, were mapped to determine distributions (Figure 2), and where they were determined to come from natural bioregional areas and shared distinctive morphological characteristics (Figure 3), these were then set aside for circumscription.

The choice in the use of species or subspecies followed Maxwell and Dekkers (2019; Maxwell *et al.* 2021): species are recognised by phenetic differences in morphology, while subspecies are only able to be discriminated by genetic diversity (Wei *et al.* 2021). A total of six species were delineated from the 430 *Ministrombus* that were examined: *M. athenius* x 144; *M. minimus* x 81; *M. variabilis* x 144; and circumscribed herein *M. aurantius* nov. sp. x 42; *M. caledonicus* nov. sp. x 13; *Ministrombus oceanicus* nov. sp. x 6. PhyloCode (2020) identification numbers (RegNum) for higher taxonomy have been provided where applicable; the species names were constructed in order to be compliant with the ICZN (1999) to provide a level of taxonomic stability in their application and use.

SYSTEMATIC PART

Superfamily	Stromboidea Rafinesque, 1815
Epifamily	Neostromboidae Maxwell, Dekkers, Rymer and Congdon, 2019 (RegNum 565, Maxwell 2021)
Family	Strombidae Rafinesque, 1815 (RegNum 566, Maxwell 2021)
Subfamily	Neostrombinae Maxwell and Rymer, 2021 (RegNum 567, Maxwell 2021)
Tribe	Dolomenini Dekkers and Maxwell, 2020 (RegNum 580, Maxwell 2021)
Subtribe	Dolomenina Dekkers and Maxwell, 2020 (RegNum 584, Maxwell 2021)

Ministrombus Dekkers, 2010
[Maxwell 2021, *nomen cladi conversum*]

Registration Number. 621.
Definition. The maximum clade consisting of *Ministrombus minimus* (Linné, 1771) and all species that share a more recent common ancestor with them than *Dolomena pulchella* (Reeve, 1851), *Labiostrombus epidromis* (Linné, 1758), *Amabiliplicatus plicatus* (Röding, 1798), *Dominus labiosus* (Wood, 1828). *Pacificus dilatatus* (Swainson, 1821), *Doxander vittatus* (Linné, 1758), *Neodilatilabrum marginatum* (Linné, 1758), *Mirabilistrombus listeri* (Gray, 1852), *Neostrombus fusiformis* (Sowerby II, 1842) or *Laevistrombus vanikorensis* (Quoy and Gaimard, 1834).

Reference Phylogeny. Figure 2 in Dekkers and Maxwell (2020).

Diagnosis. The spire has a distinct shoulder with knobs. The body whorl is shiny and almost without any sculpture except shoulder knobs on dorsum. The expanded outer lip is thickened at the inner edge and is shiny and smooth. The aperture is smooth within, only rarely lirated. The columella is smooth, with a well-defined callous. The anterior canal is short. The stromboid notch is medium deep. The posterior canal is present (Dekkers and Maxwell 2020, p. 47).

Synonymy.

Ministrombus Bandel, 2007, p. 154.

Ministrombus Dekkers, 2010, p. 9.

Type. *Ministrombus minimus* (Linné, 1771).

Ministrombus athenius (Duclos in Chenu, 1844)
(Figures 4 – 5)

Type. Image of lectotype – Duclos in Chenu (1844), pl. 11, fig. 2 (Abbott 1960, p. 104) (Figure 1).

Type Location. I shift the type location designation to Dingo Beach, Queensland. Abbott's designation of Biak Island, Dutch New Guinea is an error (= *Ministrombus aurantius* nov. sp.).

Description. The shell is light and moderately sized being triangulate. Early whorls rounded becoming strong nodulate on latter whorls. The shell is rounded when viewed axially. Nodulations form on latter whorls and are strongly angulate, axially compressed and sharp at the shoulder. The sutures are well below the shoulder. The subsutural ramp is smooth and narrow. The aperture and columella are white. There may be a dark blotch of colour in the middle, but this is not a common feature. The outer lip is thickened, always white, and well calloused, being thin posteriorly where it forms a shallow wide lobe. The outer lip joins the body of the shell between the shoulders of body whorl and of the penultimate whorl. The posterior sinus is shallow, but well-formed and not calloused. The stromboidean notch is moderately deep and well defined. The stromboidean lobe is well formed and quadrate. The anterior spiral lines are well developed. The anterior canal is straight or slightly recurved, and may extend past the anterior edge of the dorsum. Colour of ventral side varies from white to having bands of maculations or solid lines. The dorsal colouration with five light tan to brown interrupted bands on a white shell, there may be dark axial maculations that vary in width and number.

Synonymy.

Strombus (*Dolomena*) *variabilis* Swainson – Rippingale and McMichael 1961, 55, pl. 5, fig. 8. Wilson and Gillett 1971, p. 76, pl. 14, figs. 8 and 8a. Wilson and Gillett 1979, p. 76, pl. 14, figs. 8 and 8a. = *Strombus variabilis* Swainson – Hinton 1972, p. 10, pl. 5, fig. 6. Short and Potter 1987, p. 34, pl. 16, fig. 2. Jarrett 2011, p. 50, fig. 136. = *Strombus* (*Dolomena*) *variabilis variabilis* Cernohorsky 1972, p. 79, pl. 18, fig. 10. Kreipl *et al.* 1999, p. 45, pl. 91, fig. 3. = *Dolomena variabilis variablis* Swainson – Liverani 2014, p. 36, pl. 150, fig. 4. = *Dolomena variabilis* Swainson – Robin 2008, fig. 2.

1844 *Strombus athenius* Dulcos in Chenu, pl. 11, fig. 2. Tryon 1885, p. 117, pl. 6, fig. 61.

Distribution. Literary Records – *Australia* Batt Reef (Abbott 1960); Cooktown (Cernohorsky 1972); Green Island (Abbott 1960); Groote Eylandt, Gulf of Carpentaria (Abbott 1960); Low Island (Abbott 1960; Rippingale and McMichael 1961); Sweers Island, Gulf of Carpentaria (Abbott 1960); Yirrkala, Arnhemland (Abbott 1960).

Papua New Guinea Gulf of Papua (Hinton 1972). Material Examined – *Australia* Big Sandy, Swains Reef (SMC x 10; VC x 1); Boult Reef (SMC x 1); Bushy Island (VC x 1); Cairns

Reef (SMC x 1); Cooktown (YC x 1); Diamond Isles (SMC x 1); Dingo Beach (SMC x 17; VC x 21; (YC x 6).); Green Island (SMC x 2; VC x 3); Hook Reef (VC x 3); Hope Island (VC x 1); Mackeral Reef, Swains Reefs (SMC x 2); Michaelmas Cay (SMC x 1; VC x 2); Mid Reef, Horwick Reef (SMC x 4); Palm Island (SMC x 1; VC x 1); Perfect Reef, Swains Reefs (SMC x 7; VC x 11); Port Douglas (VC x 3); Prong Reef no 2, Swains Reefs (SMC x 1); Prong Reef, Swains Reefs (SMC x 1); Saumarez Reef (SMC x 2); Slashers Reef (VC x 2); St Crispins Reef (VC x 2); Swains Reefs (SMC x 5; VC x 9; (YC x 12); Trunk Reef (SMC x 3); Undine Reef (SMC x 2); Yamacutter Reef (SMC x 1). *Papua New Guinea* Milne Bay (SMC x 3).

Ministrombus minimus (Linné, 1771)
(Figures 6 – 7)

Type. Image of holotype – Rumphius (1705, 1741) pl. 36, fig. P (Figure 1).
Type Location. Cebu Island, Philippines (Abbott 1960).
Original Description. "Strombus testæ labro retuso gibbo, ventre spiraque plicato-nodosis, apertura bilabiate lævi" (Linné 1771, p. 549).
Supplementary Diagnosis. The small shell is heavy and ventro-dorsally compressed. The early spire is rounded with fine spiral striations. The later spire becoming nodulate at the shoulder with distinctive shoulder knobs that are raised and axially elongated reaching to the suture. These nodules diminish on, and are lost on, the body whorl. The suture of whorls is well below the shoulder. The ventral body whorl is smooth and flattened with a strong axial fold. The anterior of the shell typically has well-defined, evenly spaced incised lines that continue to the edge of the outer lip on the dorsal side. The whole columella is heavily calloused the length of the aperture but does not extend onto the short anterior canal. The outer lip in heavily calloused, with a wide posterior lobe where the outer lip meets the body whorl. The posterior sinus is well formed and strongly bilabially calloused. The stromboidian notch is moderately formed and the lobe is broad and not extended. The aperture is white and may have a distinctive yellow staining on the inner surface. The colour of the shell is variable, early whorls being uniform white to tan, with later whorls developing patterns that consist of four bands of fine maculations and axial lines that may form blocks of colour and merge giving rise to chocolate or tan shells. The shell loses this colouration just before the formation of the outer lip.

Synonymy.

1771 *Strombus minimus* Linné, p. 549. Gmelin 1791, p. 3516, no. 23, partly. Dillwyn 1817, p. 670. Swainson 1829, pl. 10. Sowerby 1842, pl. 6, fig. 4 and 5. Duclos in Chenu 1844, pl. 10, figs. 1 and 2. Reeve 1851, pl. 18, fig. 47. Hanley 1856, p. 124, pl. 25, fig. 26. Tryon 1885, p. 117, pl. 6, fig. 62. Dodge 1956, p. 298. Hinton 1972, p. 10, pl. 5, figs. 25 and 26. Dance 1974, p. 84. Hinton 1977b, p. 10, fig. 9. Abbott and Dance 1982, p. 79. = *Lambis minimus* Gmelin – Röding 1798, p. 65, no. 836 and 837. = *Strombus* (*Dolomena*) *minimus* Linné – Abbott 1960, p. 105, pl. 18, figs. 4 and 5, pl. 74, fig. 3, pl. 81. Cernohorsky 1965, p. 8, pl. 2, fig. 11. Cernohorsky 1972, p. 79, pl. 19, fig. 6. Springsteen and Leobrera 1986, p. 72, pl. 17, fig. 9. Kreipl *et al.* 1999, pp. 12 and 41, pl. 82, figs. 1 – 4. Okutani 2000, p. 183, pl. 91, fig. 19. = *Strombus* (*Labiostrombus*) *minimus* Linné – Willan 2000, p. 19. = *Dolomena minima* Linné – Liverani 2014, p. 36, pl. 82, figs. 1 – 4.

1822 *Strombus troglodytes* Lamarck, p. 209 – Kiener 1843, p. 52, pl. 21, fig. 2. Reeve 1860, p. 94. Tryon 1885, pp. 117 and 146, pl. 6, fig. 62.

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Distribution. Literary Records – *Fiji* (Cernohorsky 1965); Manava Island (Cernohorsky 1972); Rukua, Bega Island ('Thaanum' in Abbott 1960); Suva Point, Viti Levu Island (Abbott 1960). *Indonesia* (Cernohorsky 1965); Ambonia (Abbott 1960); Banka Island (Abbott 1960); Celebes (Abbott 1960); Dauwi Island, east Padaido Islands (Abbott 1960); Flores (Abbott 1960); Loloda (Abbott 1960); Riauw [Riau?] Islands (Abbott 1960); Timor (Abbott 1960). *Japan* Buckner Bay (Abbott 1960); Ryukyu Islands (Cernohorsky 1965). *New Caledonia* Touho Bay (Abbott 1960); South West Lagoon (Richer de Forges *et al.* 1988). *Papua New Guinea* Finschhafen (Abbott 1960); Samarai Bay (Abbott 1960); Oro Bay (Abbott 1960); Seleo island, Aitape Island (Abbott 1960); Rabaul, New Brittan (Abbott 1960; Hinton 1972). *Philippines* (Cernohorsky 1965); Camiguin Island (Abbott 1960); Cebu Island (Abbott 1960); Luzon Island (Abbott 1960); Marinduque Islands (Abbott 1960); Mindoro (Abbott 1960); Negros Island (Abbott 1960); Palawan Island (Abbott 1960); Panay Island (Abbott 1960). *Solomon Islands* Guadalcanal Island (Abbott 1960). *Taiwan* Taihoku-syu ('Kuroda' in Abbott 1960). *Vanuatu* Espiritu Santo Island (Abbott 1960). Material Examined – *Australia* Dingo Beach (SMC x 1; VC x 1; YC x 1). *Fiji* Rovondrau Bay, Suva (SMC x 1). *Indonesia* Sumberkima, Bali Island (SMC x 36). *New Caledonia* (SMC x 2). *Papua New Guinea* Kokopo (SMC x 1); Korere, Rabaul (SMC x 1); Port Moresby (SMC x 1); Rabaul (SMC x 13; YC x 1). *Philippines* Balicasag Island (SMC x 1); Cebu Island (SMC x 1); Negors Island (YC x 1). *Solomon Islands* Ghiza Harbour (SMC x 4); Guadalcanal Island (SMC x 5); Ngella Island (SMC x 1). *Vanuatu* (SMC x 2; YC x 7).

Ministrombus variabilis (Swainson, 1820)
(Figures 8 – 10)

Type. Image of lectotype – Swainson 1820, p. 10 (Figure 1).
Type Location. Cebu Island, Philippines (Abbott 1960).
Original Description. "Shell with nodulous spire not striated. Inner lip simple. Outer lip reflected, smooth within and slightly lobed above" (Swainson 1820).
Supplementary Diagnosis.
The shell is moderately sized bipyramidal. When viewed axially the early whorls are round but the shell becomes dorsoventrally compressed on the last whorl, with the ventral side appearing flat, giving the shell a moderately triangulate appearance. Early whorls are rounded and smooth with fine microscopic striations. The spire has a well-defined subsutural chord. Later whorls form a moderately angulate shoulder that continue onto the ventral body whorl. The mid-spire whorls with wide axial plaits varying in strength and may be highly diminished in some specimens. On the mid-spire the striations are variable within populations, where some individuals may be strongly striated and others without any striations. Later whorls become smooth in all specimens. The white columella is weaker posteriorly, anteriorly it tends to thicken and there is a smooth transition to the anterior canal. There is often a large dark stain in the centre of the columella. The outer lip is smooth and uniformly calloused in the midsection, while the top of the aperture is stepped and thin forming a shallow wide lobe the width of the aperture. The outer lip joins the shell somewhere between the two shoulders of the final and penultimate whorl. The stromboidean notch is wide and moderately developed. The stromboidean lobe is well developed. The anterior of the shell is somewhat constricted and elongated, and may be axially reflected to a degree, but this is

highly variable within populations. The colouration is highly variable, being typically maculated. There are thin fine axial lines. The pattern is typically interrupted by five white bands.

Synonymy.

1820 *Strombus variabilis* Swainson, p. 10. Kiener 1843, p. 49, pl. 21, fig. 2. Sowerby 1842, pl. 6, fig. 9. Duclos in Chenu 1844, pl. 11, figs, 9 and 10 ; Hanley 1856, p. 216, pl. 4, fig. 18. Reeve 1850, pl. 10, figs. 21c and d; Reeve 1860, p. 94. Tryon 1885, p. 117, pl. 6, fig. 59. Allan 1950, p. 100, pl. 17, fig. 14. Hinton 1972, p. 10, pl. 5, fig. 5. Dance 1974, p. 86. Hinton 1977a, p. 9, fig. 5. Hinton 1977b, p. 9, fig. 5. Abbott and Dance 1982, p. 79. = *Strombus* (*Gallinula*) *variabilis* Swainson - Tryon 1885, pp. 117 and 146, pl. 6, figs. 59 and 60. = *Strombus* (*Dolomena*) *variabilis* Swainson – Abbott 1960, p. 103, pl. 4, figs. 21 and 22, pl. 79, figs. 1 and 2. Springsteen and Leobrera 1986, p. 72, pl. 17, figs. 8a – c. Okutani 2000, p. 183, pl. 91, fig. 18. = *Strombus* (*Dolomena*) *variabilis variabilis* Swainson – Kreipl *et al.* 1999, p. 45, pl. 91, figs. 1, 2 and 4 – 7. = *Strombus* (*Labiostrombus*) *variabilis* Swainson – Willan 2000, p. 19. = *Dolomena variabilis* Swainson – Kronenberg 2008, pl. 225, figs. 1 – 3. = *Dolomena variabilis variabilis* Swainson – Brown 2011, p. 248. Liverani 2014, p. 36, pl. 149, fig. 4, pl. 150, fig. 1 and 2.

1829 *Strombus lituratus* Menke, p. 58, no. 1205.

Distribution. Literary Records – *Indonesia* Bouro Island, Molluccas (Abbott 1960); Woda Island, Halmahera (Abbott 1960). *Philippines* Balabac Island (Abbott 1960); Bantayan Island (Abbott 1960; Kronenberg 2008); Cebu City, Cebu Island (Abbott 1960); Cuyo Island (Abbott 1960); Legaspi Bay, Luzon Island (Abbott 1960); Olango Island (Kronenberg 2008); Samar (Kronenberg 2008); San Jose, Mindoro Island (Abbott 1960); Sanga-Sanga Island (Abbott 1960); Tabaco, Luzon Island (Abbott 1960); Tilik Bay, Lubang Island (Abbott 1960); Zamboanga, Mindanao Island (Abbott 1960). *Singapore* (Abbott 1960). *Thailand* Ban Pe, Rayong (Abbott 1960); Koh Chang (Abbott 1960); Koh Samet (Abbott 1960). Material Examined – *Indonesia* Bangka Island (SMC x 1); Raas, Kangean Island (SMC x 82); Kangean Island (SMC x 1; VC x 3); Sakala Island, Kangean Islands (SMC x 1); Singaraja, West Bali (SMC x 3). *Philippines* Aliguay Island (SMC x 1); Balicasag Island (SMC x 5); Banacon (SMC x 1; VC x 3); Bohol (SMC x 2; VC x 1); Cebu (SMC x 4; VC x 5); Dinagat Island (SMC x 3); Don Paulino (SMC x 1); Mactan Island (YC x 1); Negros (SMC x 1); Nocnocan Island (SMC x 2; YC x 4); Olango Island (YC x 1; VC x 1); Palawan (VC x 2); Virgin Island, Bantayan (SMC x 15). *Vietnam* Nha Trang (SMC x 1).

Ministrombus aurantius Maxwell, n. sp.
(Figure 11)

Type. Holotype - Kangean Islands, Indonesia, 2021, 37.8 mm (SBRF TCMOL0002). Paratype 1 – Gaya Island, Saha, Malaysia, 2010, 33.2 mm (SMC53.011b); B) Paratype 2 – Gaya Island, Saha, Malaysia, 2010, 31.5 mm (SMC53.011a); C) Paratype 3 – Kangean Islands, Indonesia, 2021, 32.5 mm (SMC53.003a); D) Paratype 4 – Kangean Islands, Indonesia, 2021, 34.2 mm (SMC53.003c); E) Paratype 4 – Indonesia, 33.9 mm (SMC53.002).

Type Location. I designate Kangean Islands, Indonesia as the type location.

Diagnosis. Shell rounded with distinctive orange solid bands and well-rounded shoulder with weak nodulations.

Description. The shell is small, ovate and round when viewed axially. Early whorls are rounded developing very weak shoulder nodules on later

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whorls that reach the suture below the shoulder. There is a moderate sutural ramp that is smooth. The nodulation on the penultimate whorl varies from nodulous to being smooth. The ventral body whorl is rounded with a distinctive axial fold. The dorsum is smooth with a few small blunt knobs. The anterior striations are faint and may be diminished to absent. The columella is well developed, white and thickened anteriorly. The aperture is white with a wide posterior lobe and joins the shell at or just above the shoulder. The posterior sinus is short and weakly calloused. The stromboidean notch is deep, and the stromboidean lobe is extended and squarish. The colour is white, with bands that vary in intensity from dark brown to orange-red to yellow, and in rare specimens form a block colour on the dorsum.

Synonymy.

Strombus (*Dolomena*) *variabilis athenius* Duclos – Kreipl *et al.* 1999, p. 45, pl. 92, figs. 1 and 2. = *Dolomena variabilis athenia* Duclos in Chenu – Liverani 2014, p. 36, pl. 149, fig. 3.

1974 *Strombus (Dolomena) variabilis palauensis* Romagna-Manoja, p. 13.

Etymology. The name reflects the Latin for orange stripes indicative of the species: *aurantiaco* – orange.

Distribution. Literary Records – Biak Island, Dutch New Guinea (Abbott 1960). *Palau* (Cernohorsky 1965). Material Examined – *Indonesia* (SMC x1); Kangean Island (SMC x 3). *Malaysia* Gaya Island, Sabah (SMC x 2; VC x 1). *Philippines* (VLC x 12); Mactan Island (VC x 1); Negros Island (YC x 1). *Solomon Islands* (VC x 2); Honiara, Guadalcanal (VLC x 3). *Papua New Guinea* Kavieng Porebada (VC x 2); Kavieng (VLC x 8); Manus Island (VLC x 3); Rabaul (VC x 1). *Samoa* ?(VLC x 2).

Ministrombus caledonicus Maxwell, n. sp.
(Figure 12)

Type. Holotype – Arama, New Caledonia, 1976, 37.8 mm (SBRF TCMOL0003). Paratype 1 – South Poum, New Caledonia, 2018, 28.8 mm (SMC52c.007d); Paratype 2 – South Poum, New Caledonia, 2018, 38.3 mm (SMC52c.007a); Paratype 3 – New Caledonia, 1976, 37.6 mm (SMC52c.005a); Paratype 4 – New Caledonia, 1976, 38.2 mm (SMC52c.005d); and Paratype 5 – New Caledonia, 1976, 42.6 mm (SMC52c.005c).

Type Location. I designate Arama, New Caledonia as the type location.

Diagnosis. The shell is moderately solid and heavy for size and ovately fusiform with a straight columella.

Description. The shell is ovately fusiform and moderately elongated. Spire whorls are rounded and slightly angulate at the shoulder. Early whorls are smooth, with faint to diminished spiral striations. The shoulder of the later spiral whorls develop nodulations that may be diminished by the penultimate whorl in some specimens. The subsutural ramp varies in development and may be absent in some specimens. The columella is weak and may be anteriorly coloured at the end. There may be a small brown blotch on the middle of the columella. The outer lip is moderately calloused and thickened and the aperture is open. The outer lip may have dark colouration in part in some specimens, and anteriorly this may also form a band of colour along the edge of the lip. The posterior sinus is shallow, short and not calloused. The body whorl is smooth and the shoulder is moderately angulate, with a few shoulder nodules that are slightly axially elongated. The colour is variable with bands ranging dark to light brown, occasionally with maculations.

Synonymy.

Strombus variabilis Swainson – Tryon 1885, p. 117, pl. 6, fig. 60. Hinton 1972, p. 10, pl. 5, fig. 4. Hinton 1977, p. 9, fig. 5a.= *Strombus* (*Dolomena*) *varaibilis* Swainson – Walls 1980, pp. 123 and 124. = *Dolomena variabilis variabilis* Swainson – Liverani 2014, p. 36, pl. 150, fig. 3.

Strombus (*Dolomena*) *variabilis athenius* Duclos – Abbott 1960, p. 104, pl. 4, fig. 20, pl. 79. figs. 3 and 4. Kreipl *et al.* 1999, p. 45, pl. 92, figs. 3 and 4. = *Strombus* (*Dolomena*) *variabilis variabilis* form *athenius* Duclos in Chenu – Cernohorsky 1965, p. 8, pl. 3, fig. 14. Ladd 1972, p. 59, pl. 18, figs. 1 and 2. Cernohorsky 1972, p. 79, pl. 18, fig. 11. = *Dolomena variabilis athenia* Duclos in Chenu – Liverani 2014, p. 36, pl. 149, figs. 1 and 2, pl. 150, fig. 3.

Etymology. The name is drawn from the Latin and reflects the locality: Caledonia - Location.

Distribution. Literary Records – *Fiji* (Cernohorsky 1965); Suva (Abbott 1960). *New Caledonia* Anse Vata (Cernohorsky 1965); barrier reef, Touho Bay (Abbott 1960); Bourail (Cernohorsky 1972); Laregnere Reef, east of Noumea (Abbott 1960); Noumea (Abbott 1960); South West Lagoon (Richer de Forges *et al.* 1988). *Papua New Guinea* ?Porabada (Hinton 1972). Material Examined – *Fiji* (VC x 1); *New Caledonia* (SMC x 4); Arama (SMC x 1); Balabic Island (YC x 1); Beleps Islands (VC x 2); ?Plage de Baffade (SMC x 1); South Poum (SMC x 6). *Tonga* (VC x 1).

Ministrombus oceanicus Maxwell n. sp.
(Figure 13)

Type. Holotype – Kwajalein, Marshall Islands, 2011, 32.4 mm (SBRF TCMOL0004). Paratype 1 – Kwajalein, Marshall Islands, 2011, 39.0 mm (SMC52b.001c); Paratype 2 – Kwajalein, Marshall Islands, 2011, 26.9 mm (SMC52b.001f); Paratype 3 – Kwajalein, Marshall Islands, 2011, 34.9 mm (SMC52b.001b); Paratype 4 – Kwajalein, Marshall Islands, 2011, 46.6 mm (SMC52b.001a); and Paratype 5 – Kwajalein, Marshall Islands, 2011, 30.8 mm (SMC52b.001d).

Type Location. I designate Kwajalein, Marshall Islands as the type locality.

Diagnosis. The shell is heavy, small and typically while with maculationd, and shoulders that are rounded with blunt nodulations that typically continue onto the dorum of the body whorl.

Diagnosis. The shell is small, heavy and solid. All the whorls rounded when viewed axially. The shoulders of the whorls are rounded and not elevated, with small low pointed nodules that are axially elongated reaching the suture in most cases and well forms on all whorls. The first whorls of the spire have microscopic fine striae which are often diminished, there are no spiral striations on later whorls. The suture of upper whorls is just below the shoulder with a fine subsutural band before the shoulder rises. The columella is smooth and calloused, being thicker and broader toward the base of the shell. The stromboidean notch is well formed and deep, and the stromboidean lobe is well defined. The anterior of the shell may have very fine highly diminished incised lines. The outer lip is thickened, calloused and rounded. The aperture is uniform with a thin wide posterior lobe that joins the outer lip to the shell. The outer lip joins at or just above the shoulder of the last whorl. The posterior sinus is moderately developed and is lobed both sides. The columella is white, and there may be a dark blotch in the middle. There is a strong ventral shoulder fold, and the shoulder is nodulated. This nodulation is variable in strength and typically carries onto the dorsum on the body whorl. The colour of the shell is white with six bands of brown to tan maculations. There is no very fine axial colouration.

Synonymy.

Strombus variabilis Swainson – Sowerby 1842, pl. 6, figs. 13 and 14. Kiener 1843, pl. 21, fig. 2a. Reeve 1850, pl. 10, figs. 21a and b.

Etymology. Named for its isolated oceanic environments: ocean - *oceanicus*

Distribution. Literary Records – *Kiribati* Gilbert Islands (Thomas 2002). *Marshall Islands* (Cernohorsky 1965); Arno Lagoon (Abbott 1960); Bikini Atoll (Abbott 1960); Kwajalein (Abbott 1960); Majuro Atoll (Abbott 1960); Rongelap Atoll (Abbott 1960). *Micronesia* Truk Island ('Gallemore' in Abbott 1960). Material Examined – Kwajalein (SMC x 6).

Comparative Remarks

Ministrombus minimus is readily discerned from other member of the genus by it dorso-ventral compression, giving it a planar appearance when viewed axially. The lobes of the anterior sinus in *M. minimus* are extended and heavily calloused. The largest and most morphologically variable of the *Ministrombus* is *M. variabilis*. However, despite its plasticity in form, *M. variabilis* is larger, more elongated, and a heaver member of the genus than its sister species. While all members of *Ministrombus* have rounded early whorls, *M. variabilis* typically is more triangulate in its final growth stage. Similar in form to *M. variabilis*, *M. athenius* can be distinguished by it more rotund shell, lighter weight and being not as axially extended as *M. variabilis*. *Ministrombus oceanicus* is a small heavy species whose ovate shell is thickened, the anterior of the columella is heavily calloused, and the body whorl is nodulose at the shoulder. This is in contrast the *M. aurantius*, a species which is lighter and when present with greatly reduced shoulder nodules. It has a columella that it is not heavily calloused anteriorly. While similar in form to *M. aurantius*, *M. caledonicus* differs in being a heavier more robust shell with a shoulder on the whorls that is more angulate, often has much stronger nodulation, and apertural colouration.

DISCUSSION

Abbott (1960) noted that there was a lack of material at his disposal to gain a full understanding of the *Ministrombus* complex. What was clear to that author was the difference between the Philippine shells and those of the central and southern Pacific. Abbott (1960) assigned the name of *M. athenuis* to the orange banded shell that is herein named *M. aurantius*. With the discovery and publishing of the other syntypes [now paralectotypes given Abbott (1960) declared the lectotype] in the Duclos collection, a more authoritative understanding of *M. athenius* can be made, and this is reflected in the taxonomy herein where it is recircumscribed to encapsulate the specimens from Queensland, and a new type locality declared. Abbott (1960) also alluded to a darker shell from New Caledonia and Solomon Islands. These observations of this author are reflected in the new species *M. caledonicus*.

CONCLUSION

This iconography illustrates a total of six *Ministrombus*, which includes 3 new species all of which have distinct morphology and most have a discrete biogeographical zonation. The recircumscription of *M. athenius*, and the shift in type location, is reflective of the type material, and this amended the attribution of Abbott (1960) enabling the recognition of *M. aurantius*. This work further adds to the growing body of recent revisions in the Strombidae and provides greater clarity of the species and their unique distributions that are contained within this complex of most beautiful marine snails.

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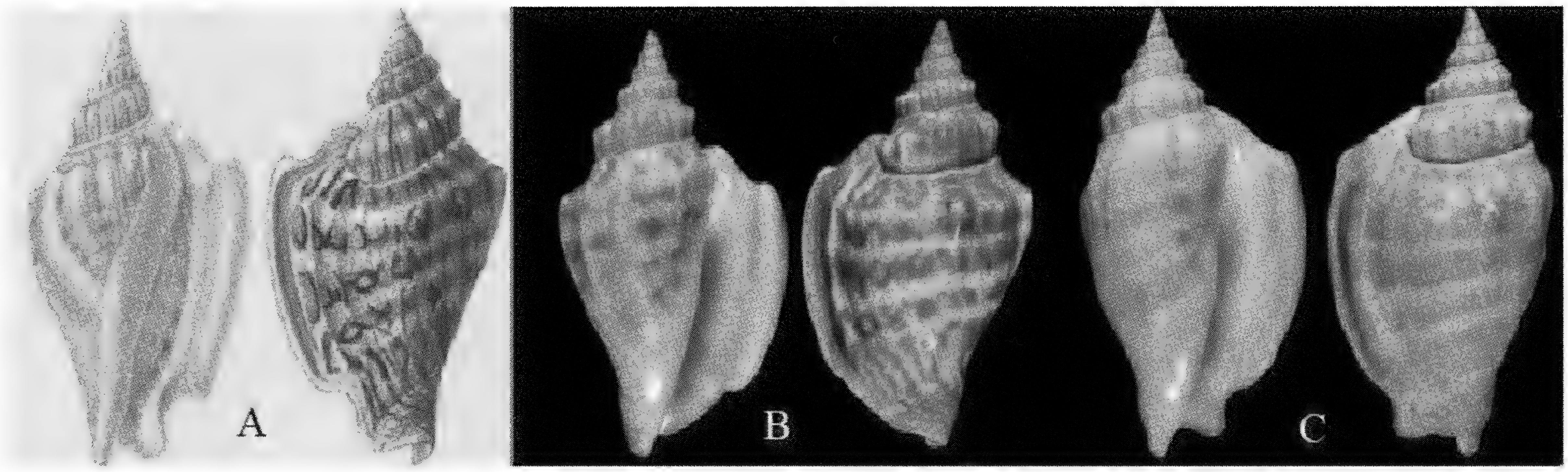


STROMBUS variabilis.

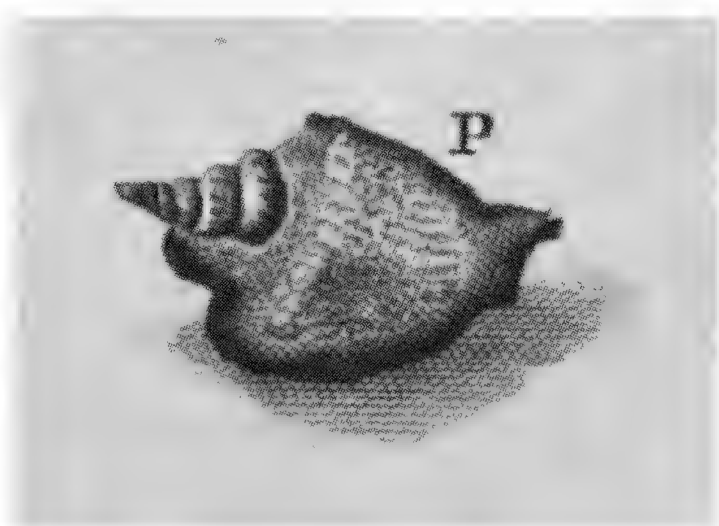
Variable Strombus—upper figure.

S. testâ nodosè plicatâ, spirâ striis nullis; labio interiore simplice, exteriore reflecto, intrà lævi, suprà leviter lobato.

Shell with nodulous plaits, the spire not striated. Inner lip simple. Outer lip reflected, smooth within, and slightly lobed above.

Shell two inches and a quarter long, the spire occupying little more than half an inch. The ground colour generally is white with numerous undulated short lines of a darker colour, sometimes crossed by four or five obsolete whitish bands: it approaches very near *S. minimus*, but is easily distinguished by being in general much larger, by having the inner lip not at all thickened above, the outer lip very slightly lobed, and only advancing on the first volution of the spire: it varies, however, amazingly in colour. There is a small variety, having a brown spot beneath, from India; and others (labelled from the So. Seas) in the Banksian collection, also small, are purplish-brown, with three or four well-defined bands of white: the aperture is always pure white.

minimus STROMBUS testæ labro retuso gibbo, ventre spiraque plicato-nodosis, apertura bilabiata lævi.
Rumph. mus. t. 36. *f. P.* Epidromis minima.
Habitat in India *orientali.*
Testa Simillima *ST. urceo*, sed minor. *Dorsum* testaceum. *Faux* lævis, flava, nec striata. *Labium* utrumque albidum.



E

Figure 1. Images of the types of described *Ministrombus*. *Ministrombus athenius* (Duclos, 1844) – **A**= the image of the lectotype Duclos (1844) pl. 11, fig. 2 (ventral), and the corresponding dorsal image, pl. 11 fig. 1; and **B, C**= the two paralectoypes held in the Muséum National D'Histoire Naturelle Paris (MNHN-IM-2000-32907). *Ministrombus variabilis* (Swainson, 1820) – **D**= The image of the lectotype of *Strombus variabilis* Swainson, 1820, p. 10. *Ministrombus minimus* (Linné, 1771) – **E**= The Linné (1771, p. 549) text and the image of the holotype (Rumphius 1705, 1741, pl. 36, fig. P).

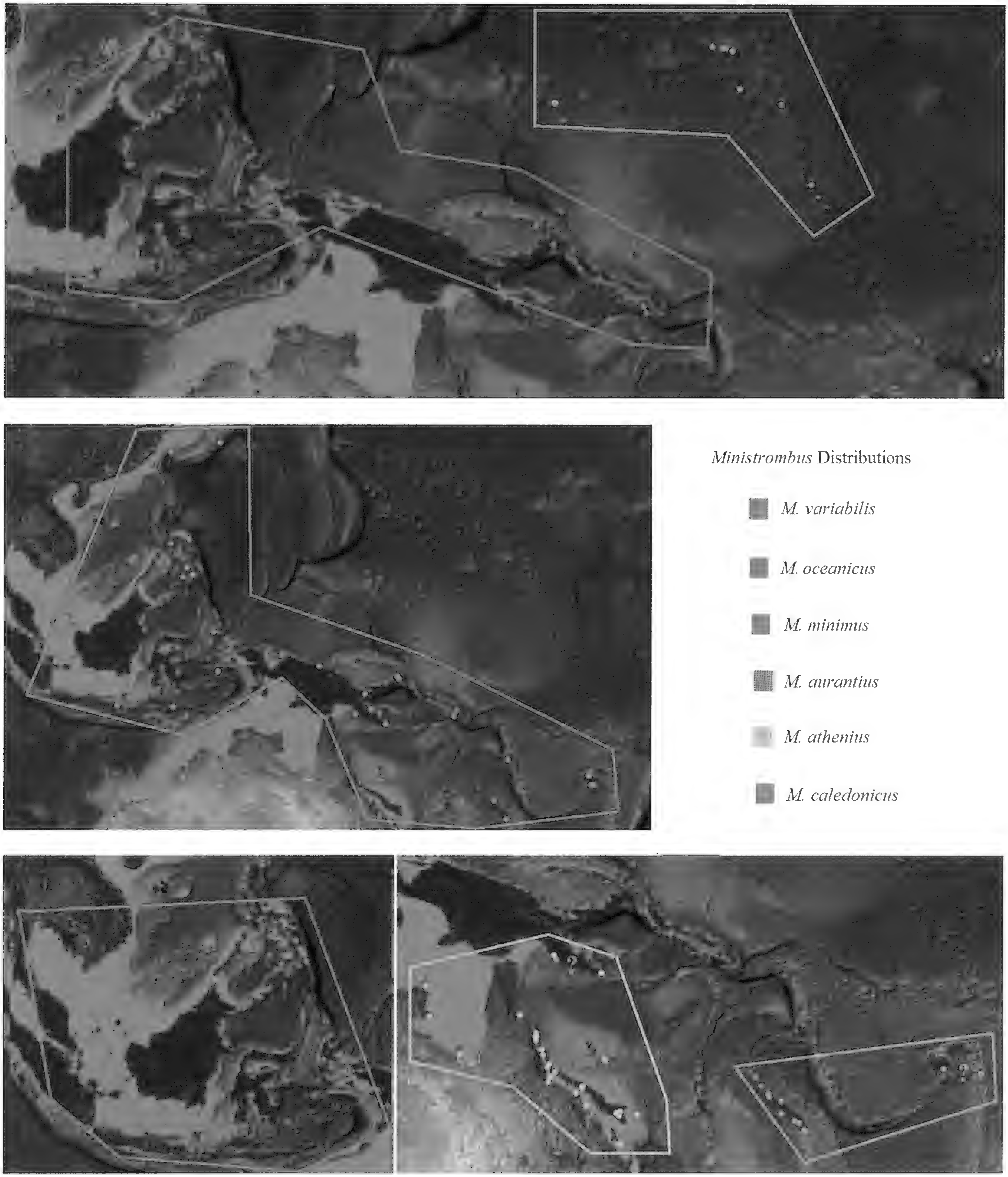


Figure 2. The estimated distribution of species contained within *Ministrombus* based on available data.

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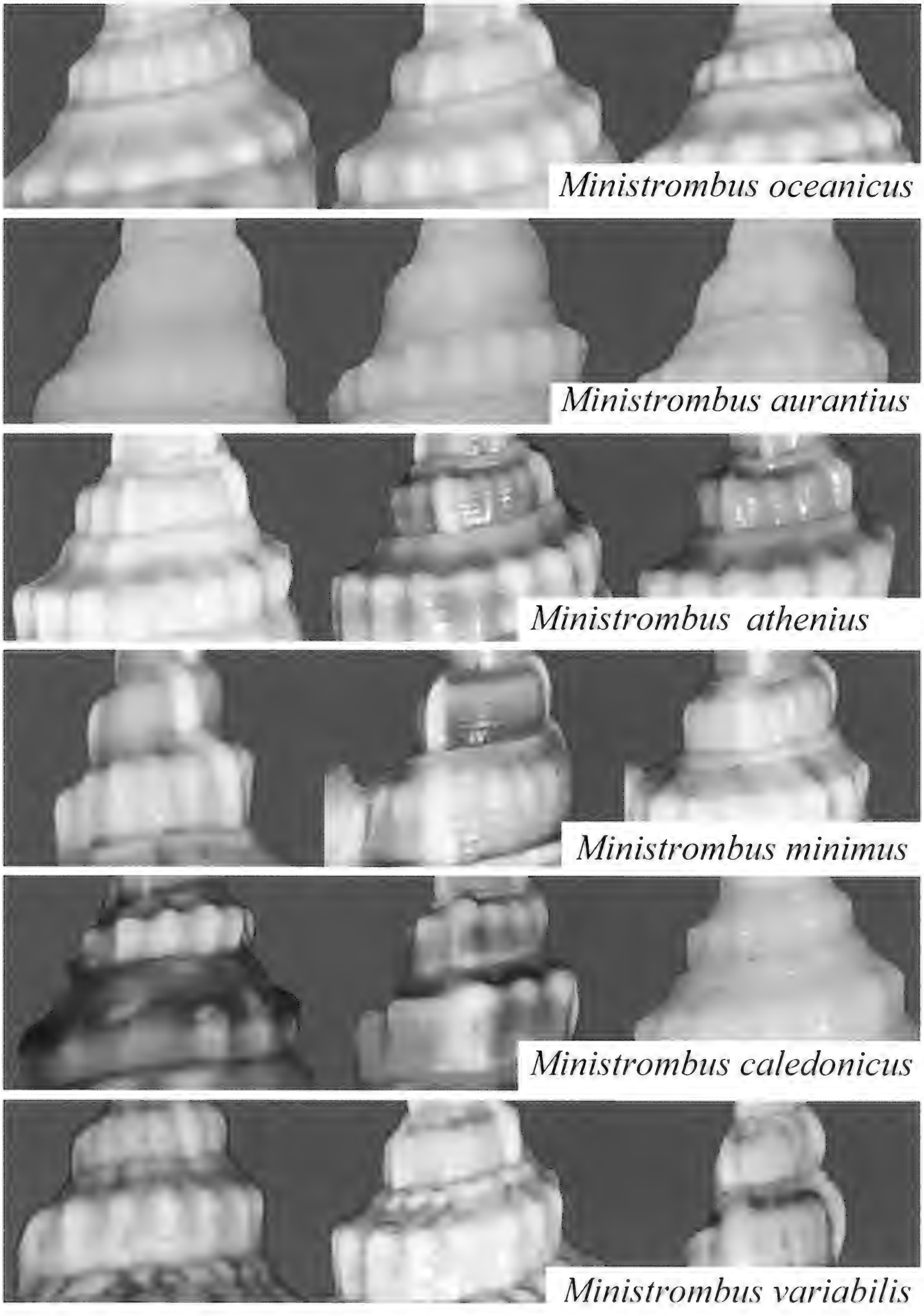

Figure 3. The mid-spire of members of *Ministrombus* showing the inter- and intra-specific variability.

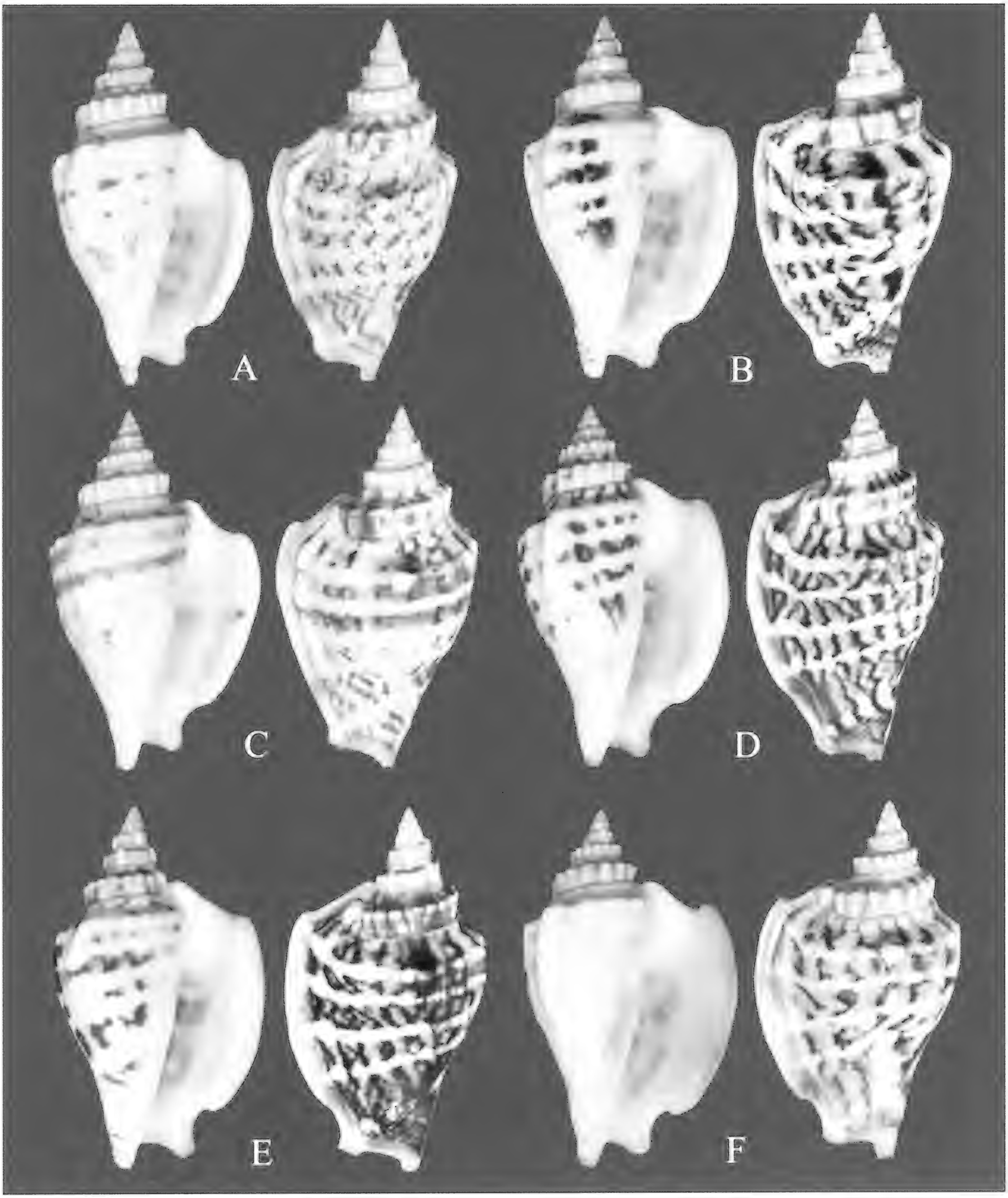

Figure 4. *Ministrombus athenius* (Duclos, 1844): **A**= Perfect Reef, Swains Reefs, Queensland, 2002, 47.0 mm (SMC52a.006f); **B**= Green Island, Queensland, 2021, 39.1 mm (SMC52a.026b); **C**= Cairns Reef, Queensland, 1981, 43.3 mm (SMC52a.020); **D**= Kurrimine Beach, Queensland, 40.2 mm (SMC52a.023b); **E**= Dingo Beach, Queensland, 1984, 39.3 mm (SMC52a.0); F) Yamacutter Reef, Queensland, 2018, 37.2 mm (SMC52a.019).

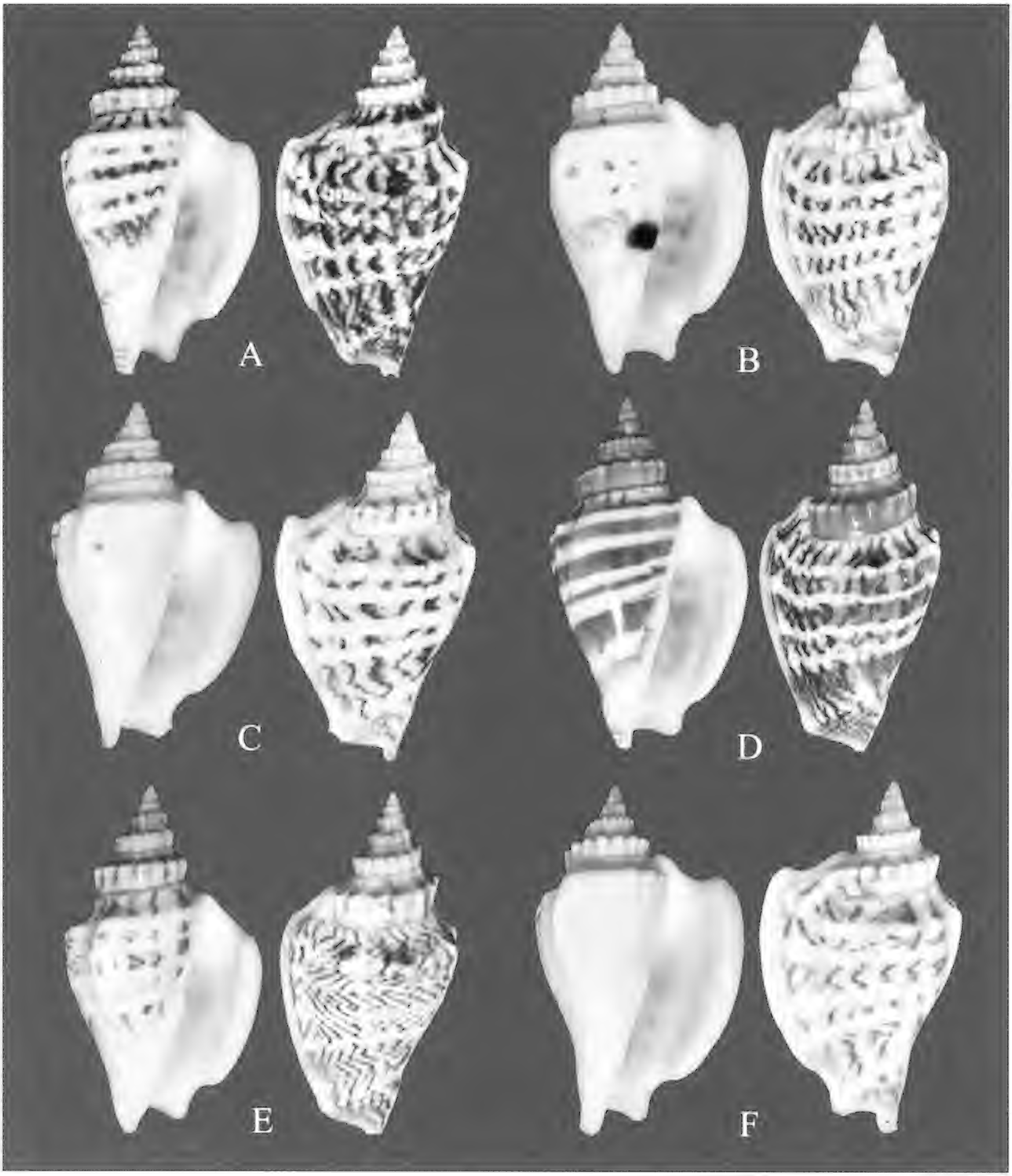

Figure 5. *Ministrombus athenius* (Duclos, 1844): **A**= Big Sandy, Swains Reefs, Queensland, 1999, 44.5 mm (SMC52a.002b); **B**= Big Sandy, Swains Reefs, Queensland, 1999, 39.9 mm (SMC52a.002a); **C**= Undine Reef, Queensland, 2009, 42.0 mm (SMC52a.022b); **D**= Milne Bay, Papua New Guinea, 1990, 48.2 mm (SMC52a.012b); **E**= Dingo Beach, Queensland, 1992, 47.6 mm (SMC52a.003b); and **F**= Trunk Reef, Queensland, 2003, 37.1 mm (SMC52a,008a).

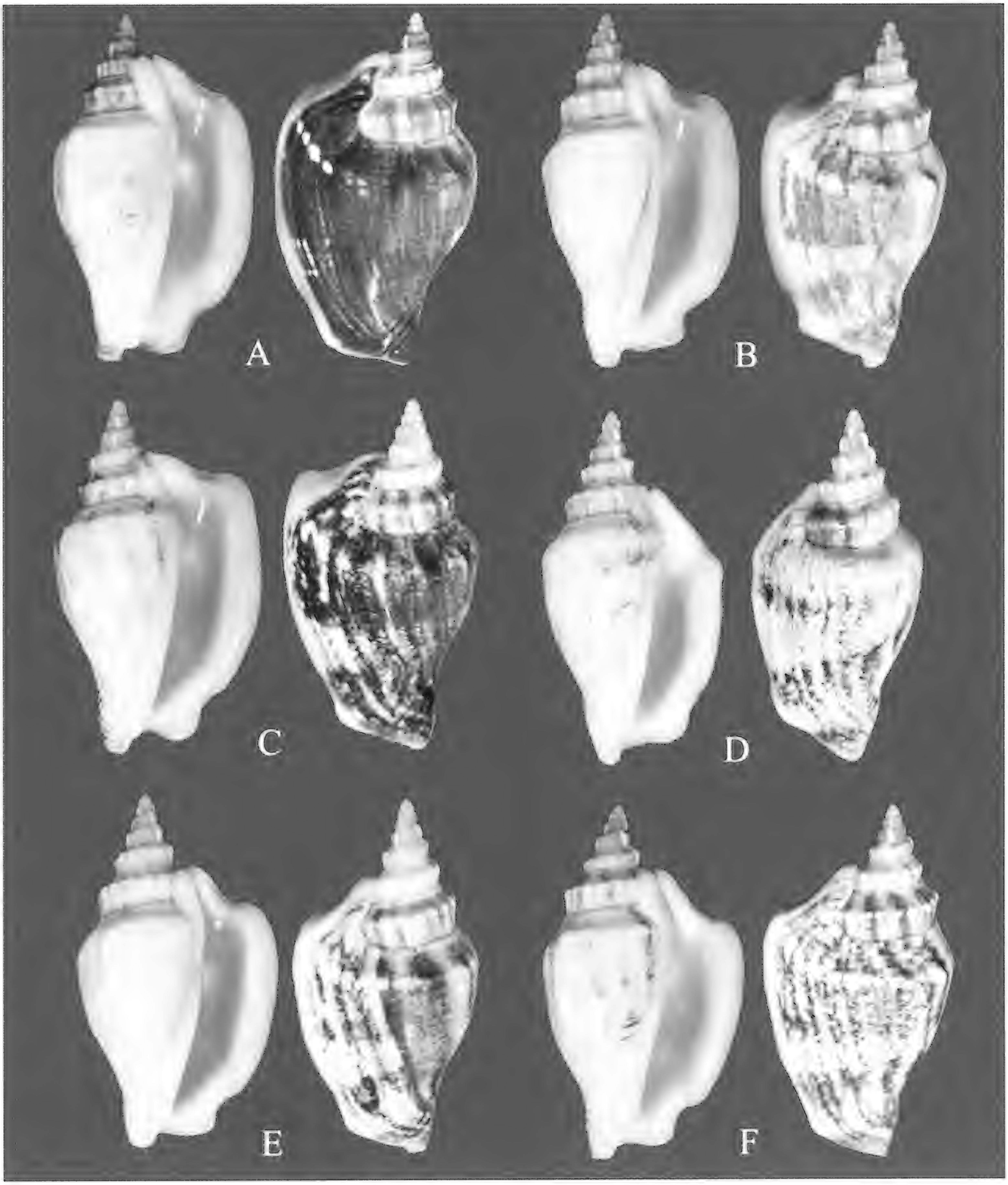

Figure 6. *Ministrombus minimus* (Linné, 1771): **A**= Sumber Kima, Bali Island, Indonesia, 2020, 33.1 mm (SMC58.009w); **B**= Sumber Kima, Bali Island, Indonesia, 2020, 31.4 mm (SMC58.009b); **C**= Sumber Kima, Bali Island, Indonesia, 2020, 31.9 mm (SMC58.009e); **D**= Sumber Kima, Bali Island, Indonesia, 2020, 33.0 mm (SMC58.009y); **E**= Sumber Kima, Bali Island, Indonesia, 2020, 31.6 mm (SMC58.009l); and **F**= Sumber Kima, Bali Island, Indonesia, 2020, 36.5 mm (SMC58.009u).

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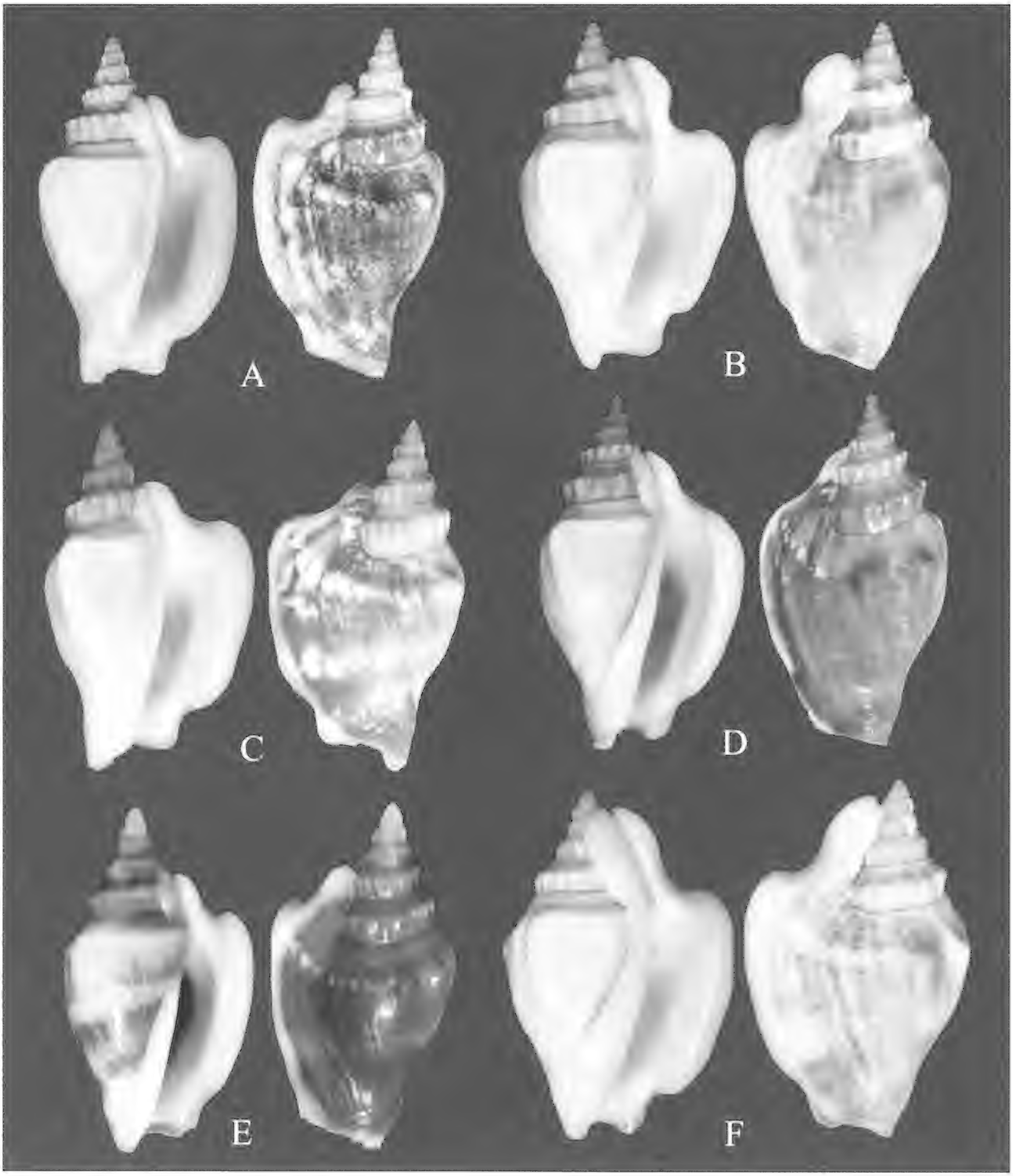

Figure 7. *Ministrombus minimus* (Linné, 1771): **A)** Balicasag Island, Philippines, 2015, 32.9 mm (SMC58.008); **B)** Guadalcanal, Solomon Islands, 2014, 21.2 mm (SMC58.006b); **C)** Vanuatu, 2014, 22.4 mm (SMC58.003b); **D)** Rovandrau Bay, Suva, Fiji, 1978, 32.8 mm (SMC58.012); **E)** Rabaul, Papua New Guinea, 2008, 22.5 mm (SMC58.004g); and **F)** Rabaul, Papua New Guinea, 2008, 22.7 mm (SMC58.004e).

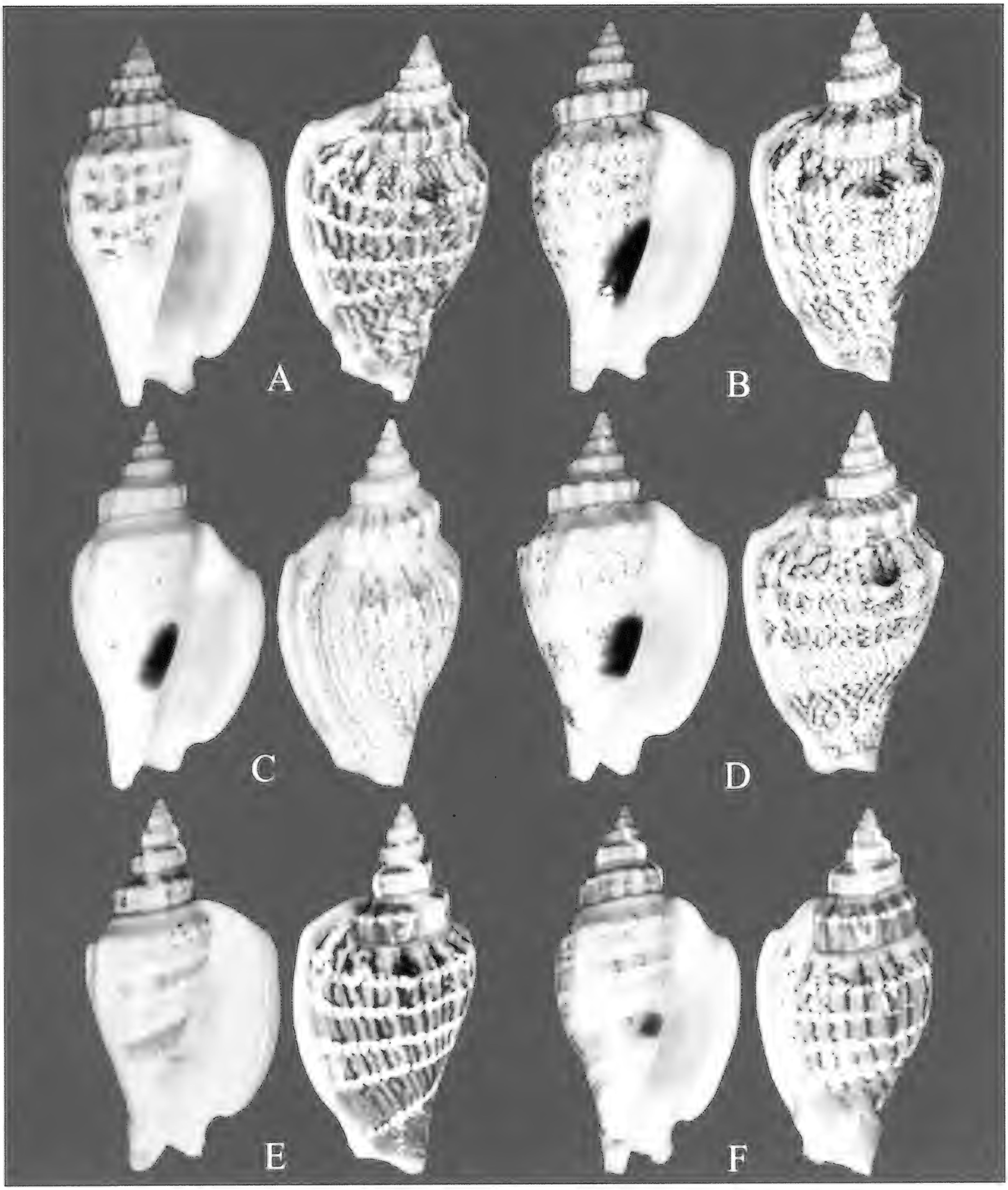

Figure 8. *Ministrombus variabilis* (Swainson, 1820): **A)** Balicasag Island, Philippines, 2019, 36.5 mm (SMC52.009e); **B)** North Bohol, Philippines, 2019, 53.66 mm (SMC52.007b); **C)** Cebu Island, Philippines, 1970, 53.22 mm (SMC52.017b); **D)** Banacon, Philippines, 2019, 46.3 mm (SMC52.010m); **E)** Negros Island, Philippines, 2019, 57.6 mm (SMC52.004); and **F)** Dinagat Island, Philippines, 2009, 55.6 mm (SMC52.002c).

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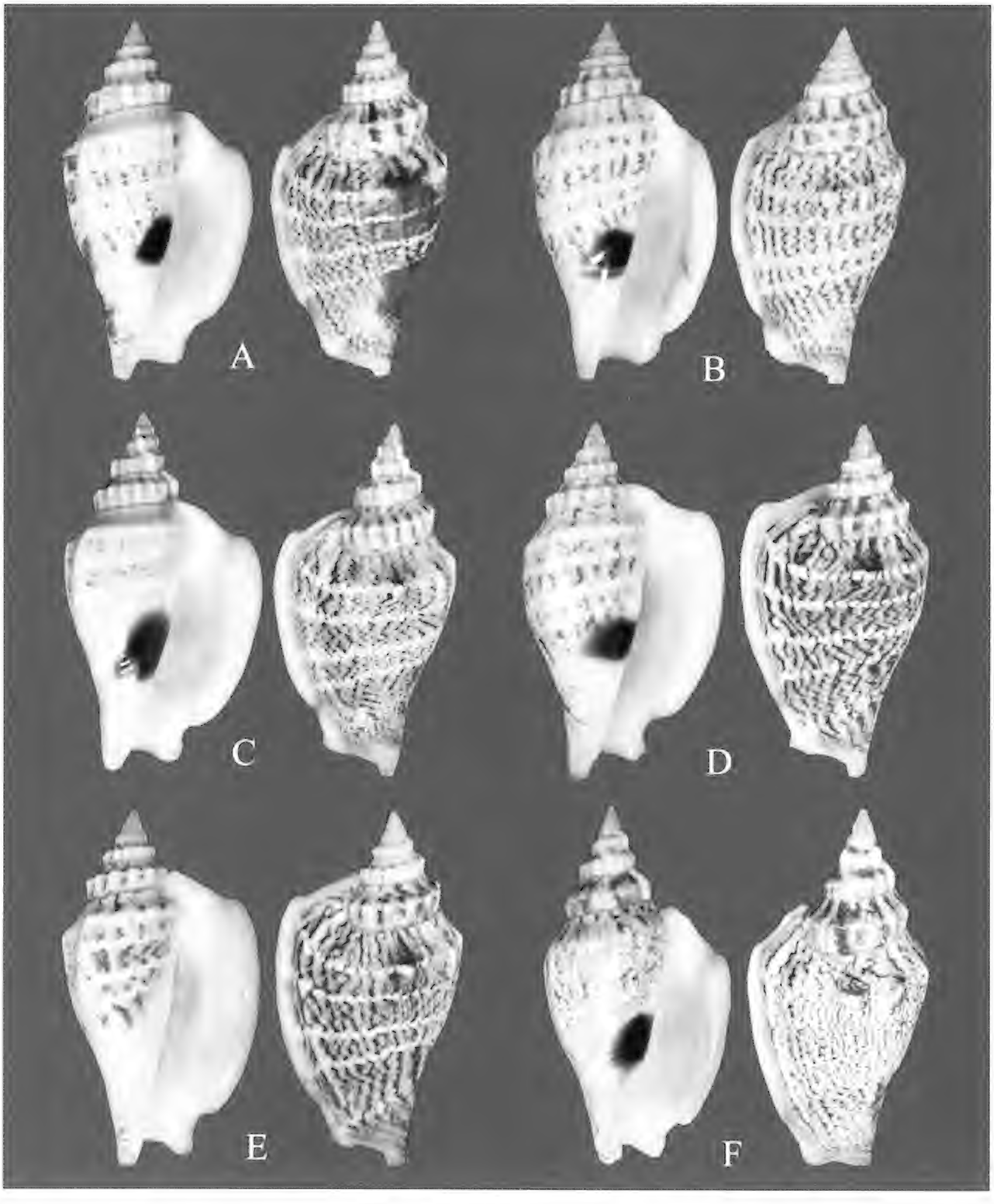

Figure 9. *Ministrombus variabilis* (Swainson, 1820): **A**= Cebu Island, Philippines, 2019, 56.9 mm (SMC52.011); **B**= Dinagat Island, Philippines, 2009, 56.8 mm (SMC52.002b); **C**= Nocnocan Island, Philippines, 2019, 51.4 mm (SMC52.005b); **D**= Balicasag Island, Philippines, 2019, 35.2 mm (SMC52.009a); **E**= Banacon, Philippines, 2019, 40.9 mm (SMC52.010d); **F**= Virgin Island, Bantayan, Philippines, 2019, 64.6 mm (SMC52.006b).

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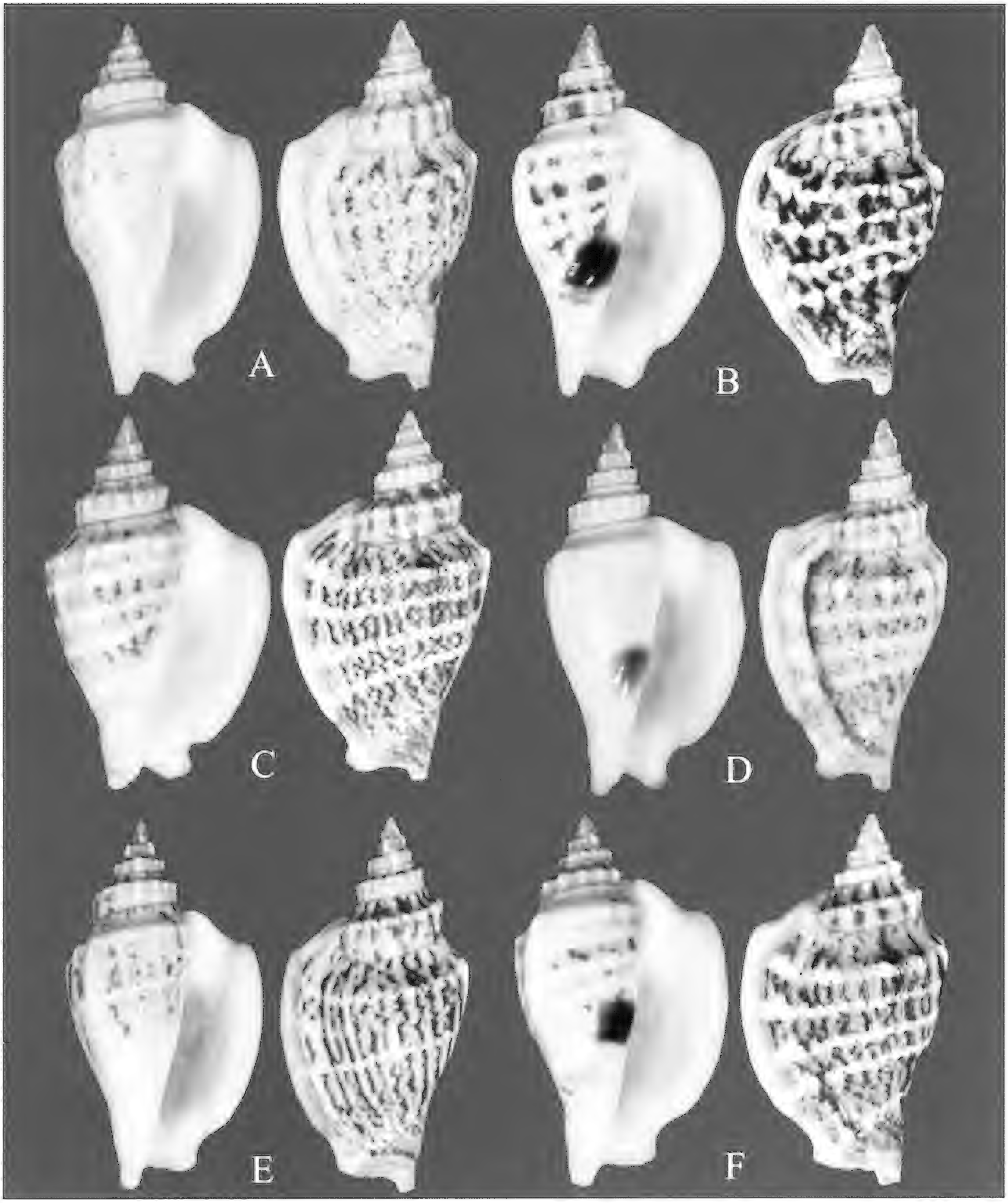

Figure 10. *Ministrombus variabilis* (Swainson, 1820): **A**= Raas, Kangean Islands, Indonesia, 2021, 43.3 mm (SMC52.016aj); **B**= Raas, Kangean Islands, Indonesia, 2021, 39.6 mm (SMC52.016f); **C**= Raas, Kangean Islands, Indonesia, 2021, 39.4 mm (SMC52.016au); **D**= Raas, Kangean Islands, Indonesia, 2021, 42.0 mm (SMC52.016m); **E**= Raas, Kangean Islands, Indonesia, 2021, 48.0 mm (SMC52.016e); and **F**= Raas, Kangean Islands, Indonesia, 2021, 39.3 mm (SMC52.016l).

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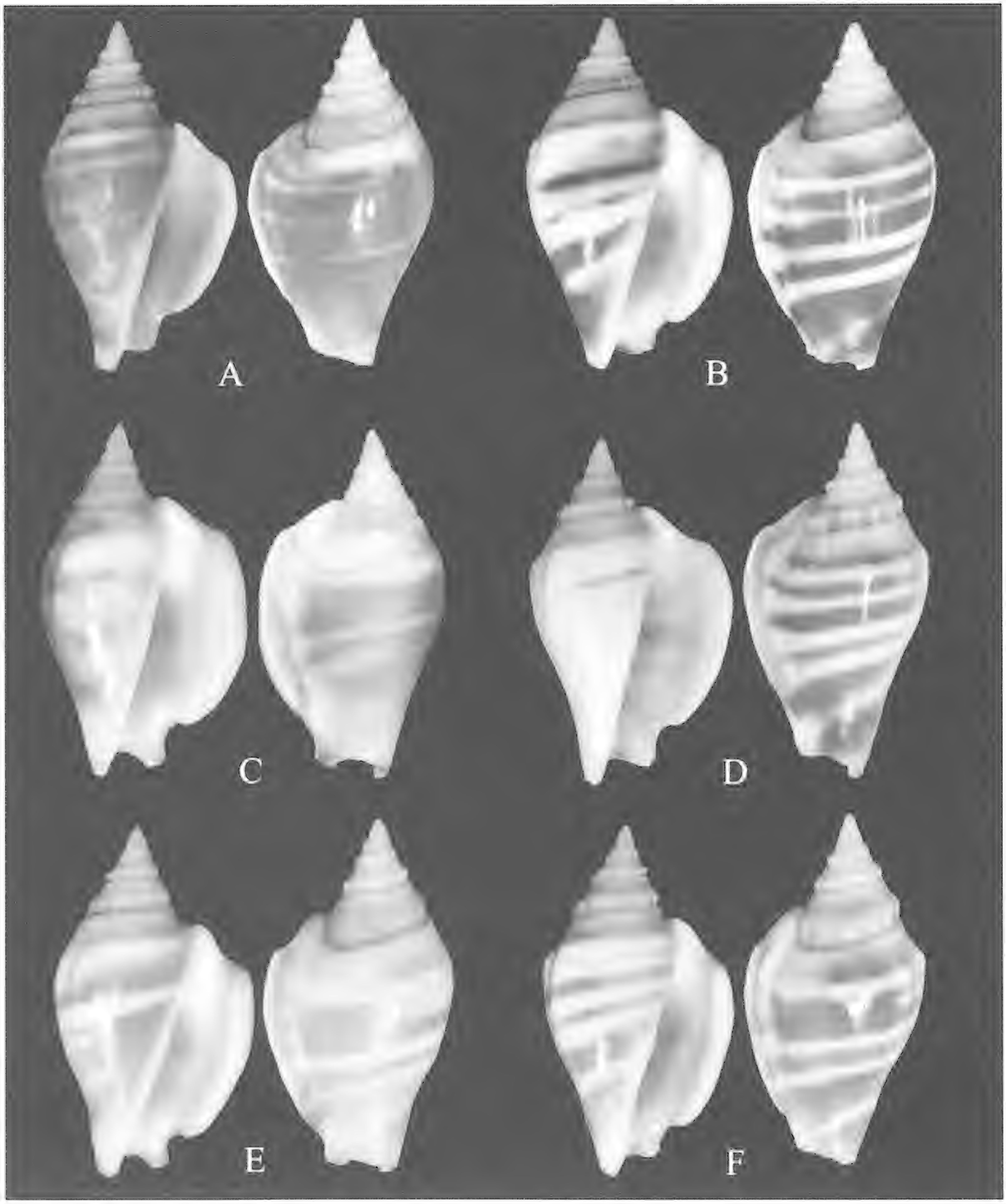

Figure 11. *Ministrombus aurantius* nov. sp. : **A**= Paratype 1 – Gaya Island, Saha, Malaysia, 2010, 33.2 mm (SMC53.011b); **B**= Paratype 2 – Gaya Island, Saha, Malaysia, 2010, 31.5 mm (SMC53.011a); **C**= Paratype 3 – Kangean Islands, Indonesia, 2021, 32.5 mm (SMC53.003a); **D**= Paratype 4 – Kangean Islands, Indonesia, 2021, 34.2 mm (SMC53.003c); **E**= Paratype 4 – Indonesia, 33.9 mm (SMC53.002); and **F**= Holotype - Kangean Islands, Indonesia, 2021, 37.8 mm (SBRF TCMOL0002).

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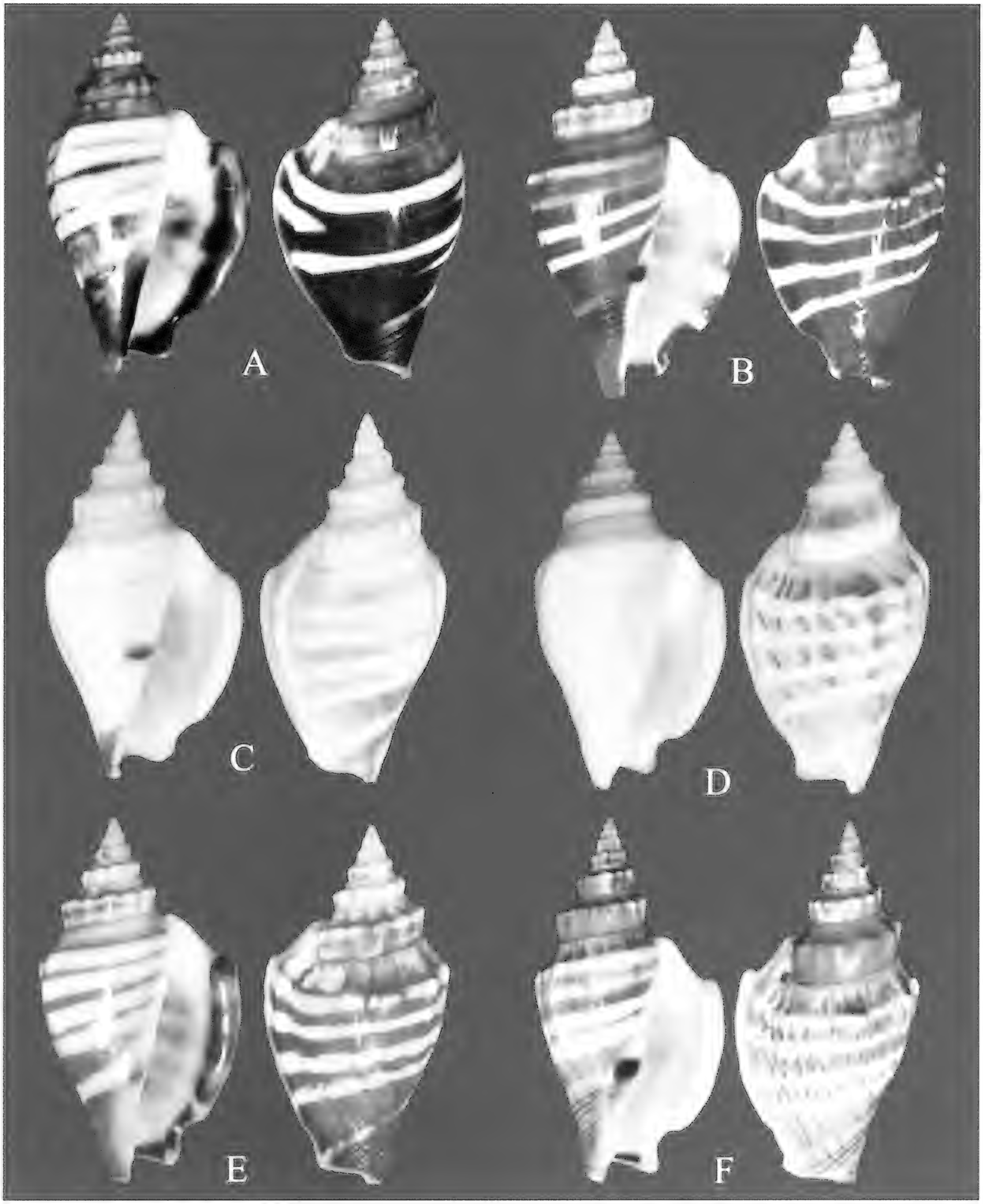

Figure 12. *Ministrombus caledonicus* nov. sp.: **A**= Paratype 1 – South Poum, New Caledonia, 2018, 28.8 mm (SMC52c.007d); **B**= Paratype 2 – South Poum, New Caledonia, 2018, 38.3 mm (SMC52c.007a); **C**= Paratype 3 – New Caledonia, 1976, 37.6 mm (SMC52c.005a); **D**= Paratype 4 – New Caledonia, 1976, 38.2 mm (SMC52c.005d); **E**= Holotype – Arama, New Caledonia, 1976, 37.8 mm (SBRF TCMOL0003); and **F**= Paratype 5 – New Caledonia, 1976, 42.6 mm (SMC52c.005c).

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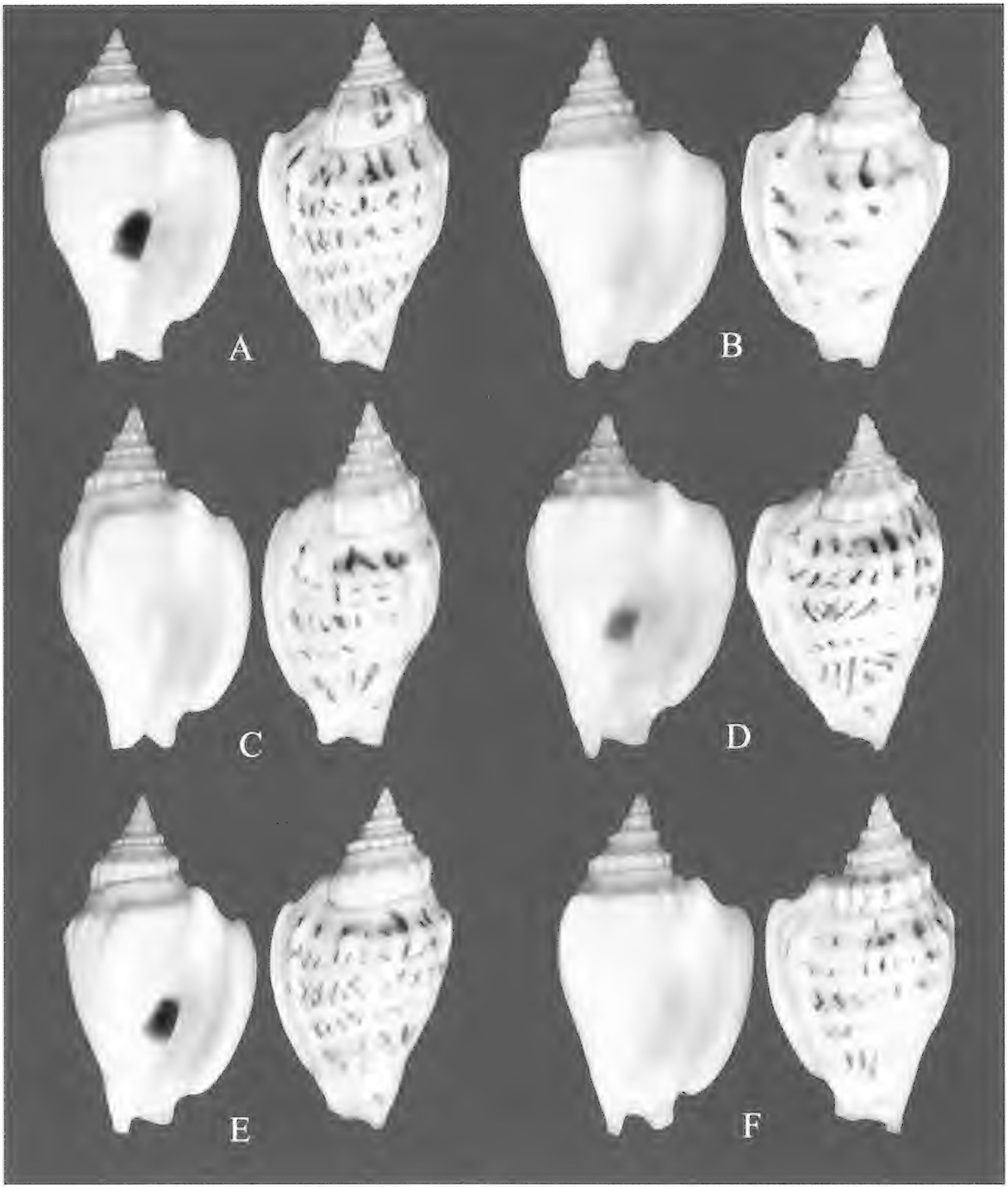

Figure 13. *Ministrombus oceanicus* nov. sp.: **A**= Paratype 1 – Kwajalein, Marshall Islands, 2011, 39.0 mm (SMC52b.001c); **B**= Paratype 2 – Kwajalein, Marshall Islands, 2011, 26.9 mm (SMC52b.001f); **C**= Paratype 3 – Kwajalein, Marshall Islands, 2011, 34.9 mm (SMC52b.001b); **D**= Holotype – Kwajalein, Marshall Islands, 2011, 32.4 mm (SBRF TCMOL0004); **E**= Paratype 4 – Kwajalein, Marshall Islands, 2011, 46.6 mm (SMC52b.001a); and **F**= Paratype 5 – Kwajalein, Marshall Islands, 2011, 30.8 mm (SMC52b.001d).

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A revision of *Doxanderina* Dekkers and Maxwell, 2020 (Gastropoda: Neostromboidae: Strombidae): The extant *Doxander* Wenz, 1940 and a new species from Queensland

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ABSTRACT In this study, the extant *Doxanderina* species are addressed. Species contained within *Doxander* are examined based on type material, and a new species from Queensland is recognised. Comparisons are made based on morphology. This revision recognises six species in the *Doxander* complex: *D. campbellii*, *D. entropi*, *D. japonicus*, *D. queenslandicus* nov. sp, *D. operosus*, and *D. vittatus*. *Doxander queenslandicus* is most similar to *D. vittatus* from Indonesia, but differs in the body whorl being more dorso-laterally compressed, having a terminal point of the anterior canal which does not extend past the outer lip as in *D. vittatus*, and the presence of a dorsal knob on the shoulder of *D. queenslandicus*.

KEY WORDS *Doxander*, Indo-Pacific, new species, Queensland, Taxonomy

INTRODUCTION

This study revises the extant *Doxander* Wenz, 1940, a clade of marine molluscs, it is the first in a series of papers examining the *Doxanderini* Dekkers and Maxwell, 2020, which includes extant and fossil species within *Doxander* and *Neodilatilabrum* Dekkers, 2008, as well as the extinct genus *Laevispira* Raven, 2021. Recent revisions at the species level in Strombidae have demonstrated the taxonomic practice of aggregating taxa (Abbott 1960, 1961), lumping, which has led to an underestimation of the potential diversity within the complex (Maxwell *et al.* 2020; Dekkers and Maxwell 2020a; Maxwell and Dekkers 2021a, 2021b). Similarly, stromboidean revisions at the species level have often not addressed the issues of precedence, nor considered type material, giving rise to ongoing taxonomic confusion and misidentification (Man in't Veld and Visser 1993).

Doxanderini and its sister taxon, *Dolomenina* Dekkers and Maxwell, 2020 are contained within *Dolomenini* Dekkers and Maxwell, 2020. The relational definitions that underpin these taxa provide the framework upon which further study can be undertaken, including the recognition and study of fossil taxa (see Maxwell 2021). Raven (2021, p. 40) noted "As their analysis demonstrates all are closely related and fossil material has been excluded from their analysis, they are herein interpreted as subgenera. That will facilitate further analysis at generic level including extinct species". There is no need to relegate the taxonomy to subgenera on the ground of allowing for further analysis that included extinct taxa. The use of higher taxonomy with definitional relationships allows for fossil inclusivity, irrespective of the taxa that were used to define those clades. Understanding what the role of definitions are in taxonomy, and how those definitions are intended to be used to bring relational meaning, and how these names are constructed under the PhyloCode (2020), is

still to permeate the world of mollusca and leads to misunderstandings on inclusivity and exclusivity of the definitions.

With regards *Doxander* Wenz, 1940, again Abbott (1960), collapsed or relegated all but one taxon, under the *Strombus* (*Doxander*) *vittatus* Linné, 1758, leaving *Strombus* (*Doxander*) *campbellii* Griffith and Pidgeon, 1834 and *Strombus* (*Doxander*) *listeri* Gray, 1852 as the three extant members of *Doxander* Iredale, 1931. Okutani (1965) removed *Strombus listeri* Gray, 1852 from *Doxander* and placed it within *Euprotomus* Gill, 1870, later it was moved to the monotypic genus *Mirabilistrombus* Kronenberg, 1998. Man in't Veld and Visser (1993) revised much of the *Doxander* and reinstated, and expanded, the complex at the subspecific level, thus supporting the taxonomy of Abbott (1960) at the species level, noting a number of distinct regional subspecies, and this revision has formed the basis for the taxonomic consensus on the internal content within *Doxander* (Dekkers and Maxwell 2020b). However, it is considered herein too conservative taxonomically to consider these as subspecies; these should be recognised as species based on morphological and geographical conceptuality (Maxwell and Dekkers 2019; Dekkers and Maxwell 2020b) as did Kronenberg and Wieneke (2020).

More recently there has been renewed interest in the typology of the *Doxander* (Kronenberg and Wieneke 2020), which has necessitated a full review of the genus. There has been a mismatch in what is considered "*vittatus*" within revisions (Dodge 1956; Abbott 1960; Man in't Veld and Visser 1993; Kronenberg and Wieneke 2020). The syntype material contained within the Linnaean Collection, London, and the supporting literary references supplied by Linné (1758) (= *Doxander operosus* (Röding, 1798), except for which is not indicative of the current purported species in the literature except for the Rumphius (1705, 1741) figure O that was designated as the lectotype by Man in't Veld and Visser (1993). This designation is reflected in the *Doxander vittatus* (Linné, 1758) herein, and this in agreement with the most recent work that dealt with *Doxander*, Kronenberg and Wieneke (2020). In this revision, I seek to give clarity to the members of the Doxander, examine the types to ensure that they are consistent with the nomenclature, and provide examples of each species.

Abbreviations

SMC Stephen Maxwell Collection, Cairns, Queensland.
VC Valda Cantamessa Collection, Proserpine, Queensland.
SBRF BlueSky Research Foundation, Cairns, Queensland.

Methods

This study uses shell morphology to examine the variability with in the *Doxander* Wenz, 1940 post Abbott (1960) after Man in't Veld and Visser (1993) to identify potential species. This process involved the examination of the nomenclature and a referral back to the type material (Figures 1 - 3) and examined how the nomenclature reflects that type material, and where there is inconsistency or error the nomenclature was determined, the nomenclature was corrected to reflect the systematics. This enabled a list of existing species to be generated upon which to commence the review. The choice in the use of species or subspecies followed Maxwell and Dekkers (2019; Maxwell *et al.* 2021): species are recognised by phenetic differences in morphology irrespective of geographical distribution, while subspecies are only able to be discriminated by genetic diversity (Wei *et al.* 2021).

A total of 586 specimens were examined with five species recognised: *Doxander campbellii* (Griffith and Pidgeon, 1834) (n = 292), *Doxander queenslandica* n. sp. (n = 93), *Doxander japonicus* (Reeve, 1851) (n = 34), *Doxander entropi* (Man in't Veld and Visser, 1993) (n = 74), *Doxander vittatus* (Linné, 1758) (n = 10) and *Doxander operosus* (Röding, 1798) (n = 84). Comparative images of the mid-teleoconch (Figure 4) and upper-outer lip (Figure 5) were provided to illustrate differences between species (Where a literary reference to a location could not be located it has been omitted). Location information for each species was mapped to estimate the known ranges of each species (Figures 6 - 7).

PhyloCode (2020) identification numbers (RegNum) for the taxonomy have been provided where applicable; the names were constructed in order to be compliant with the ICZN (1999) to provide a level of taxonomic stability in their application and use.

SYSTEMATIC PART

Superfamily	Stromboidea Rafinesque, 1815
Epifamily	Neostromboidae Maxwell, Dekkers, Rymer and Congdon, 2019 (RegNum 565, Maxwell 2021)
Family	Strombidae Rafinesque, 1815 (RegNum 566, Maxwell 2021)
Subfamily	Neostrombinae Maxwell and Rymer, 2021 (RegNum 567, Maxwell 2021)
Tribe	Dolomenini Dekkers and Maxwell, 2020 (RegNum 580, Maxwell 2021)
Subtribe	Doxanderina Dekkers and Maxwell, 2020 (RegNum 581, Maxwell 2021)

Doxander Wenz, 1940

Type Species. *Strombus vittatus* Linné, 1758, p. 545, no. 439 (Wenz 1840).
Registration: RegNum 582 (Maxwell 2021).
Definition. The maximum clade consisting of *Doxander vittatus* (Linné, 1758) and all species that share a more recent common ancestor with them than with *Neodilatilabrum marginatum* (Linné,1758), *Dolomena pulchella* (Reeve, 1851), *Labiostrombus epidromis* (Linné, 1758), *Ministrombus minimus* (Linné,1771), *Mirabilistrombus listeri* (Gray, 1852), *Neostrombus fusiformis* (Sowerby II, 1842) or *Laevistrombus vanikorensis* (Quoy and Gaimard, 1834) (Maxwell 2021, p. 197).
Original Description. "Gehäuse groß bis sehr groß, schlank, spindelförmig; Gewinde hoch; Umgänge gewölbt, mit schmalem, glattem Streifen unter der Naht und axialen Rippen; Endwindung fast glatt oder mit mehr oder weniger deutlichen axialen Rippen, auf der unteren Hälfte mit Spiralrillen" (Wenz 1940, p. 945) [Translation: Shell large to very large, slender, spindle-shaped; high spire; whorls rounded, with small spiral line under the suture and axial ribs; body whorl almost smooth or with distinct axial ribs on the lower half with spiral grooves (Dekkers and Maxwell 2020, p. 42)].
Supplementary Diagnosis. The lateral tooth has a peg at the base, while the marginal teeth are thickened ovately. The operculum is strongly serrated. The aperture of the shell is always white. There is a short thin appendage on the posterior part of the mantle.
Synonymy.
Doxander Iredale, 1931, p. 212 (Type – *Strombus vittatus* Gmelin, 1791 = *Strombus vittatus* Linné, 1758), unavailable (Dekkers and Maxwell 2020).
Doxander Wenz, 1940, p. 945 (Type – *Strombus vittatus* Linné, 1758).

Doxander campbellii (Griffith and Pidgeon, 1834)
(Figures 1A and 8)

Type. Drawing representing the holotype: Griffith and Pidgeon (1834), pl. 25, fig. 6 (Figure 1A), (Man in't Veld and Visser 1993, p. 30).
Type Locality. Abbott (1960) provided Bowen, Queensland, as a population that conformed to the morphology and colour to the type image. However, Man in't Veld and Visser (1993, p. 30) deemed Abbott (1960) lacked explicitly in declaring the type locality, and instead selected Peron Peninsula, Shark Bay, Western Australia.
Original Description. "Brown with obscure bands" (Griffith and Pidgeon 1834, p. 600, index to plate 25).
Supplementary Diagnosis. Shell 40 - 70 mm in height. With nucleus of 3.5 glossy translucent whorls. The subsutural chord is well defined in post nuclear whorls, with strong axials (beading). The teleoconch typically has rounded low varices which vary in number and are typically white. As the shell size increases the sub-sutural chord develops elongated beading axially that become reduced or absent on the final whorl. Dorsum of the body whorl smooth with a pronounced rounded knob preceded by a smaller shoulder axial swelling. Lower body whorl with numerous fine incised spiral lines. The columella is well defined, white, and contains lirae anteriorly, with one or two possible lirae present posteriorly. The aperture with usually weak spiral lirae within the inside of the outer lip. Labrum flattened horizontally outside. On the apertural rim only a midpart swelling. The posterior channel reaches or just passes the subsutural chord. The colour is often white ground colour with messy brown flames, but clear orange and pink to purple specimens are not rare.

Synonymy.
Strombus campbellii "Gray" Griffith and Pidgeon, 1834, p. 600, pl. 25, fig. 6. = *Strombus campbellii* Gray – Kiener 1843, p. 55, pl. 24, fig. 2. *Strombus campbelli* var. Sowerby - Duclos 1844, pl. 14, figs. 6 and 7, pl. 26, fig. 3. Sowerby, 1847, p. 26, pl. 6, figs. 22 and 23. Hedley 1908, p. 460. Hedley 1918, p. M63. = *Strombus campbelli* var. Sowerby - Duclos 1844, pl. 10, figs. 6 and 7. = *Strombus* (*Gallinula*) *campbelli* Griffith and Pidgeon – Chenu 1859, p. 257, fig. 1598. Tryon 1885, p. 115, pl. 5, fig. 46. = *Strombus campbelli* Gray - Reeve 1860, p. 93. Tryon 1885, p. 136. = *Strombus campbellii* Griffith and Pidgeon – Hedley 1908, p. 459. = *Doxander campbelli* Griffith and Pidgeon – Iredale 1931, pp. 201 - 235. Allan 1950, p. 100. De Bruyne 2003, p. 92. = *Strombus* (*Doxander*) *vittatus campbelli* Griffith and Pidgeon – Abbott 1960, pp. 37 and 114, pl. 17, fig. 13, pl. 90. Cernohorsky 1972, p. 80, pl. 18, fig. 3. = *Strombus* (*Doxander*) *campbelli* Griffith and Pidgeon – Rippingale and McMichael 1961, p. 56, pl. 5, fig. 12. Wilson and Gillett 1971, p. 38, pl. 17, fig. 2. Wilson and Gillett 1979, p. 73, pl. 13, fig. 9. Walls 1980, pp. 125, 126 and 188. Man in't Veld and Visser 1993, p. 29. Kreipl *et al.* 1999, pp. 13 and 48, pl. 98. = *Strombus campbelli* Griffith and Pidgeon – Dance 1974, p. 81. Stone and Bawden 1975, pp. 58 and 59. Hinton 1977a, p. 12, no. 3. Hinton 1977b, p. 9, no. 3. Short and Potter 1987, p. 32, pl. 15, fig. 2. 'Sowerby' Man in't Veld and Visser 1993, p. 29. Jansen 1996, p. 17, fig. 52, FC. Potter and Whitehead 1998, p. 82. Deas 1971, unnumbered page/plate, fig. 2. Wilson 2002, pp. 108 and 109. = *Strombus vittatus campbelli* Griffith and Pidgeon –

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Oliver and Nicholls 1975, p. 78. Abbott and Dance 1982, p. 79.

Alaba sulcata Watson, 1886, p. 570, pl. 42, fig. 7. Hedley 1908, p. 460. = *Alaba* (*Styliferina*) *sulcata* Watson - Abbott 1960, p. 114. = *Strombus sulcata* Watson - Walls 1980, p. 190. Abbott and Dance 1982, p. 79.

Strombus vittatus Linné - Hinton 1972, p. 6, pl. 3, fig. 16. Gabbi 1999, p. 128.

Distribution. This species ranges across the northern coastline of Australia where is often encountered living in large colonies (Figure 6A). Man in't Veld and Visser (1993) have a record from Indonesia, and Abbott (1960) from the Solomon Islands. These ex-Australian records have yet to be verified. Literary records – *Australia* Weld Island (Man in't Veld and Visser 1993); Dampier (Man in't Veld and Visser 1993); Eighty Mile Beach (Abbott 1960); Monkey Mia, Shark Bay (Man in't Veld and Visser 1993); Broadhurst Bight, Shark Bay (Man in't Veld and Visser 1993); Cape Bossut (Abbott 1960); La Grange Bay (Abbott 1960); Broome (Man in't Veld and Visser 1993); Ridall's Beach, Broome (Abbott 1960); Black Ledge, Broome (Abbott 1960); sand flats, 2½ miles south of Broome (Abbott 1960); North-West Cape (Man in't Veld and Visser 1993); Cape Leveque (Abbott 1960); Lee Point, Darwin (Man in't Veld and Visser 1993); East Point, near Darwin (Abbott 1960; Man in't Veld and Visser 1993); Van Dieman's Gulf (Abbott 1960); Yikkala, Arnhem Land (Abbott 1960); Gulf of Carpentaria ('Roth' in Abbott 1960); off Cape York ('Watson' in Abbott 1960); between Hammond and Wednesday Islands ('Melvill and Standen' in Abbott 1960); Sandy Cape ('Reeve' Hedley 1908); Bedford Beach (Abbott 1960); Cairns (Abbott 1960); Dunk Island (Abbott 1960); Magnetic Island (Abbott 1960; and McMichael 1961; Man in't Veld and Visser 1993); Queens Beach, Bowen (Abbott 1960; Rippingale and McMichael 1961; Man in't Veld and Visser 1993); Kings Beach, Bowen (Man in't Veld and Visser 1993); Dingo Beach (Man in't Veld and Visser 1993); Langford Reef (Man in't Veld and Visser 1993); Mackay (Man in't Veld and Visser 1993); Yeppoon, Keppel Bay (Man in't Veld and Visser 1993); Keppel Island (Abbott 1960); Capricorn Islands (Hedley 1908); Bustard Head (Abbott 1960); Caloundra (Cernohorsky 1972); Moreton Bay (Abbott 1960); Amity Point, North Stradbroke Island (Man in't Veld and Visser 1993); Port Stephens ('Angas' in Hedley); Sydney (Iredale 1931; Allan 1950). *Solomon Islands* (Abbott 1960). *Indonesia* Dobo, Aru Islands (Man in't Veld and Visser 1993). Material examined – *Australia* Alexandra Reef (SMC x 1); Amity Point, Stradbroke Island (SMC x 2); Barrow Island (SMC x 15); Bountiful Island, Gulf of Carpentaria (SMC x 1); Broome (SMC x 9); Cannonvale (SMC x 1); Cape Kerau Dren (SMC x 1); Cape York Peninsula (SMC x 2); Dalrymple Point, Bowen (SMC x 1); Dingo Beach (SMC x 95); Dredged, S.E. Mooloolaba (SMC x 1); Dredged, Shellbourne Bay (SMC x 1); Dundowran Beach (SMC x 2); Fraser Island (SMC x 6); Gloucester Passage (SMC x 5); Herald Bight, Shark Bay (SMC x 6); Horseshoe Bay, Magnetic Island (SMC x 3); Hunter Island (SMC x 5); Jarman Island, Wickham (SMC x 3); Keppel Island (SMC x 8); King Reef (SMC x 6); Kurrimine Beach (SMC x 6); Mooloolaba (SMC x 1); Pallaranda (SMC x 1); Pancake Creek (SMC x 2); Port Headland (SMC x 2); Reginald Bay (SMC x 1); Roebuck Bay (SMC x 1); Rowley Shoals (SMC x 1); Saunders Beach (SMC x 9); Shark Bay (SMC x 3); Shelly Beach (SMC x 12); Shoal Point (SMC x 17); Stradbroke Island (SMC x 1); Tangalooma (SMC x 2);Thursday Islands (SMC x 1); Torres Straits (SMC x 3); Townsville (SMC x 1); Trawled, Townsville (SMC x 18); Wonga Beach (SMC x 2); Yirrkala, Gove (SMC x 1).

Remarks. This species is endemic to northern Australia and the obvious difference to all other

species in the genus is the strong axially sculptured subsutural chord. The closest fossil ancestor is possibly *Strombus triangulatus* Martin, 1879 from the Upper Miocene of Java, Indonesia. *Strombus triangulatus* shares the triangulate shape, subsutural chord, and sculpture of the body whorl of *D. campbellii*, the fossil species lacks the strongly placated spire of *D. campbellii*. *Doxander campbellii* is sympatric with *D. queenslandica* n. sp. In Queensland and the Northern Territory. Though the species is distributed from North West Australia to East Australia (Queensland), I do not see any morphological differences between shells from the diverse locations.

Doxander japonicus (Reeve, 1851)
(Figures 1B and 9)

Type. Drawing representing the holotype: Reeve 1851, pl. 17, fig. 42 (Figure 1B). According to Abbott (1960), Reeve's type is presumably in the Museum of Natural History in London.

Type Locality. Nagasaki, Japan (Abbott 1960).

Original Description. "Shell fusiformly turreted, spire much exerted, whorls transversely very closely and regularly grooved throughout, slantingly concave round the upper part, somewhat obscurely plicately noduled at the angle, longitudinally finely ribbed towards the apex, columella callous, laminated, lip winged, conspicuously radiately wrinkled within; white, stained and variegated with red-brown, encircled with narrow white zones, interrupted with arrow-headed markings, columella and interior of the aperture ivory-white" (Reeve 1851, sp. 42).

Supplementary Diagnosis. Shell with distinctive fusiform shape with a spire with rounded shoulders with nodules that are axially elongated. The body whorl with distinctive small shoulder knobs. The body whorl with fine spiral striae covering the surface. The columella is well formed, and is uniform the length of the aperture.

Synonymy.

Strombus japonicus Reeve, 1851, pl. 17, fig. 42. Lischke, 1869, pl. 5, fig. 7. Dance 1974, p. 86. = *Strombus* (*Gallinula*) *japonicus* Reeve – Chenu 1859, p. 257, fig. 1598. Tryon 1885, pp. 115 and 140; pl. 5, fig. 48. = *Strombus* (*Labiostrombus*) *japonicus* Reeve - 'Kira' Abbott 1960, p. 113. = *Strombus* (*Doxander*) *vittatus japonicus* Reeve – Abbott 1960, pp. 37 and 113, pl. 17, fig. 18. Walls 1980, pp. 127, 128 and 189. Man in't Veld and Visser 1993, p. 11. = *Doxander vittatus japonicus* Reeve – Kira 1962, p. 35, pl. 16, fig. 13. = *Strombus vittatus japonicus* Reeve – Oliver and Nicholls 1975, pp. 78 and 79. Abbott and Dance 1982, p. 79. = *Strombus* (*Doxander*) *japonicus* Reeve – Man in't Veld and Visser 1993, p. 28, pl. 3, figs. 10 and 11. Kreipl *et al.* 1999, pp. 13 and 47, pl. 95, figs. 1 and 2. Okutani 2000, p. 183, pl. 91, fig. 15.

Distribution. Found from southern Japan to the northern South China Sea (Figure 6B). Literary records – *Japan* Ashiya (Man in't Veld and Visser 1993); Kyoto (Man in't Veld and Visser 1993); Wakayama (Man in't Veld and Visser 1993); Saitosaki (Man in't Veld and Visser 1993); Tsuijasaki (Man in't Veld and Visser 1993); Nonai, Matsu Bay, Honshu Island ('Nomura and Hatai' in Abbott 1960); Oga Peninsula, Honshu Island ('Nishimura and Watabe' in Abbott 1960); Yamagata Prefecture, Honshu Island ('Nomura and Zimbo' in Abbott 1960); Tateyama, near Tokyo Bay, Honshu Island (Abbott 1960); Suruga Bay, Honshu Island ('Oyama' in Abbott 1960); Shirako, Honshu Island (Abbott 1960); Ei, Awaji Island (Abbott 1960); Hiroshima, Honshu Island (Abbott 1960); Isshiki, Hazu-gun, Honshu Island (Abbott 1960); Wakasa Bay, Honshu Island (Abbott 1960); Tosa Bay, Shikoku Island

(Abbott 1960; Man in't Veld and Visser 1993); Chikuzen, Kyushu Island (Abbott 1960); Tomioka, Amakusa, Kyushu Island (Abbott 1960); Nagasaki, Kyushu Island (Abbott 1960); Ise Bay (Abbott 1960); Bonin Islands (Abbott 1960). *South Korea* Chyido? (Man in't Veld and Visser 1993). Material Examined – *China* East China Sea (VC x 1); South China Sea (SMC x 3); *Japan* (VC x 3); Chiba (SMC x 1); Mei, Wakayama (SMC x 1).

Remarks. A distinctive species with a pronounced radial sculpture on all whorls, that is not commonly found in the seas off the coasts of Japan. There are recent catches of dead material coming from fishermen operating out of China in the East China Sea. Records for the South China Sea are not specific.

Doxander entropi (Man in't Veld and Visser, 1993)
(Figures 1C and 10)

Type. Drawing representing the lectotype: *Strombus sulcatus* var. Chemnitz – Duclos 1844, pl. 25. figs. 5 and 6 (designated herein) (Figure 1C).

Type Locality. Philippines, Stranley Point, Canacao, Manila Bay, Luzon Island (Man in't Veld and Visser 1993).

Original Description. "Posterior channel always reaches the suture and sometimes even the suture of the next whorl. The whorls are more stepped than in other species (originally: subspecies). Axial sculpture never occurs on the body whorl, but it does occur on other whorls, sometimes even on all other whorls. All whorls are radially sculptured, more strongly so on the lower half of the whorls. This radial sculpture is never as pronounced as in *S. japonicus*. Material from the Sulu Sea generally has a somewhat higher spire than specimens from the South China Sea. The colour of this subspecies is often somewhat darker than that of the other species, except where it concerns transition forms. These shells are usually light brown. The height of the shell varies from 50 to c.110 mm" (Man in't Veld and Visser 1993, p. 26).

Supplementary Diagnosis. Shell highly variable in form. Spire stepped with numerous spiral striae and axial plaits in most examples that are most pronounced on the shoulder. The subsutural chord is well developed and continues to the middle of the dorsal body whorl where it fades prior to the formation of the flaring outer lip. The aperture is wide and the columella is well formed being thickened centrally, and continues to the form a posterior canal with the outer lip that terminates between the first and second suture. The body whorl is smooth with occasional specimens having ventral feint axial plaints in some examples. The base of the body whorl has strong spiral threads towards the anterior that continue to the edge of the shell.

Synonymy.

Rostellaria sinuata Perry, 1811, pl. 11. fig. 3.

Strombus vittatus Linné – Kiener 1843, pl. 23, fig. 1b. = *Doxander vittatus* Linné – De Bruyne 2003, pp. 92 and 93. = *Strombus* (*Gallinula*) *vittatus* Linné – Chenu 1859, p. 257, fig. 1601. Tryon 1885, pl. 4, fig. 41. = *Strombus* (*Doxander*) *vittatus vittatus* Linné – Walls 1980, pp. 127 and 128. Springsteen and Leobrera 1986, p. 70, pl. 17, fig. 7a. = *Strombus vittatus vittatus* Linné – Abbott 1960, p. 112; pl 17, fig. 14 right. Abbott and Dance 1982, p. 79. = *Strombus* (*Doxander*) *vittatus* Linné – Okutani 2000, p. 183, pl. 91, fig. 17.

Strombus sulcatus Chemnitz – Duclos 1844, pl. 24, figs. 1 and 2. Sowerby 1847, p. 27, pl. 6, fig. 31. Hanley 1856, p. 124, pl. 25, fig. 29. Tryon 1885, pp. 114 and 145, pl. 4, fig. 44. Dodge 1956, p. 277. = *Strombus sulcatus* var. Chemnitz – Duclos 1844, pl. 25, figs. 5 and 6, pl. 26, figs. 4 and 5. Man in't Veld and Visser 1993, p. 26. = *Strombus sulcatus* Holten, 1802 p. 56.

Cernohorsky 1965, p. 9. Walls 1980, p. 190. Man in't Veld and Visser 1993, p. 11.

Strombus (*Doxander*) *vittatus entropi* Man in't Veld and Visser, 1993, p. 26, pl. 2, figs. 7 – 12. Kreipl *et al*. 1999, pp. 13 and 47, pl. 96.

Doxander entropi Man in't Veld and Visser, 1993 – Kronenberg and Wieneke 2020, fig. 28.

Distribution. Records indicate that this species is predominately centred on the Philippines (Abbott 1960; Man in't Veld and Visser, 1993), with only sporadic references to the countries bordering the South China Sea (Abbott, 1960) (Figure 6C). Examples of this species are known from the Queensland Coast (SMC x 2; VC x 1) and northern New South Wales (Nichols Collection), and these are under active consideration. Literary records – *Philippines* Paranaque, Luzon Island (Man in't Veld and Visser 1993); Siasi, Sulu (Man in't Veld and Visser 1993); Stranley Point, Luzon Island (Man in't Veld and Visser 1993); Sulu Archipelago (Man in't Veld and Visser 1993); Sulu Sea (Man in't Veld and Visser 1993); Tayabas Bay, Quezon Island (Man in't Veld and Visser 1993). Material Examined –*Philippines* Aliguat Island (SMC x 1); Bohol Island (SMC x 1); Calituban Island (SMC x 4); Cebu (SMC x 19; VC x 2); Davao (SMC x 21); Mactan Island (SMC x 3); Manila Bay (VC x 2); Molcabuc Island (VC x 1); Negros Island (VC x 1).

Remarks. A species with distinctive strongly angulate spiral whorls. *Strombus sulcatus* Chemnitz, 1795 (p. 142, pl. 195, figs. 1870 and 1871; Chemnitz and Holten 1802, p. 56, no. 34) is considered to be *nomen dubium*. The form of the spire with disjoined sutures, and the lack of typical axial ribbing on early whorls and other distinguishing features makes his figure and description problematic to fix with any of the known members of Strombidae.

Doxander operosus (Röding, 1798)
(Figures 1E, 2A and 11)

Type. Drawing representing the lectotype: Chemnitz 1788, pl. 155, fig. 1482 (Kronenberg and Wieneke 2020; Figure 1E).

Type Locality. Vietnam, Nha Trang (designated here in).

Original Description. "Der künstliche Thurm. Gmel. *Strombus vittatus.* sp. 25. γ. Favanne t. 20. f. A. 8. Chemn. 10. t. 155. f. 1481. 82. 2 St." (Röding 1798, p. 107).

Supplementary Diagnosis. Shell elongated with a high strongly axially plicated spire. The shoulders of the spiral whorls are moderately rounded with a distinctive subsutural chord that extends to the end mid-dorsal whorl. The ventral body whorl with distinctive axial plaits that run form the shoulder to the mid-whorl. The dorsal body whorl typically smooth, with some specimens having residual axial plaits. The base of body whorl with strong deep incised axial striae. The columella is centrally thickened and forms a slight reflected posterior canal with the outer lip that typically does not extend past the first suture.

Synonymy.

Strombus vittatus Linné – Duclos 1844, pl. 23. figs. 1 and 2. Sowerby 1847, p. 26, pl. 6, figs. 28 and 29. Reeve 1851, pl. 17, fig. 44a. Hanley 1855, p. 273. = *Strombus* (*Ampliati*) *vittatus* Gmelin, 1791, 13th edn., p. 3517, no. 25, partly. = *Lambis vittata* Gmelin – Röding 1798, p. 66, no. 838. Man in't Veld and Visser 1993, p. 19. = *Strombus* (*Gallinula*) *vittatus* Linné – Tryon 1885, p. 114, pl. 4, fig. 42. 'Schepman' Man in't Veld and Visser 1993, p. 19. = *Strombus vittatus* Linné – Kiener 1843, pl. 23, fig. 1. Martin 1883-1887, p. 143. 'Reeve (partly)' Man in't Veld and Visser 1993, p. 19. Chim *et al.* 2009, p. 379. = *Doxander vittatus* Linné – 'Habe and Kosuge' Man in't Veld and

Visser 1993, p. 19. = *Strombus (Doxander) vittatus* Gmelin - Beets 1950, p. 245. = *Strombus* (*Doxander*) *vittatus* Linné – 'Ma Siu-Tung' Man in't Veld and Visser 1993, p. 19. = *Strombus vittatus vittatus* Linné – Abbott and Dance 1982, p. 79, right fig. 'Wye' Man in't Veld and Visser 1993, p. 19. = *Strombus* (*Doxander*) *vittatus vittatus* Linné – 'Lindner' Man in't Veld and Visser 1993, p. 19.

Turris operosa Röding, 1798, p. 125, no. 1607. Kronenberg and Wieneke 2020, p. 106.

Strombus australis Schröter, 1805, p. 95 – Abbott 1960, p. 113. Cernohorsky 1965, p. 9. Cernohorsky 1972, p. 80. Walls 1980, p. 188. Man in't Veld and Visser 1993, p. 11. = *Strombus vittatus australis* Schröter – Abbott 1960, p. 113, pl. 17, left fig. 14. Oliver and Nicholls 1975, p. 78. = *Strombus* (*Doxander*) *vittatus vittatus australis* Schröter – Springsteen and Leobrera 1986, p. 72, pl. 17, fig. 7b.

Strombus vittatus angustior Chemnitz, 1788, pl. 155, figs. 1481 and 1482. Dillwyn 1817, p. 671.

Strombus turritus Lamarck, 1822, p. 212. Kiener 1843, p. 42, pl. 24, fig. 1. Duclos 1844, pl. 9, figs. 1 - 4. Sowerby 1847, p. 26, pl. 6, fig. 27. Martin 1883-1887, p. 143. Man in't Veld and Visser 1993, p. 11. = *Strombus vittatus turritus* Lamarck – Tryon 1885, p. 114, pl. 4, fig. 42. 'Eisenberg' Man in't Veld and Visser 1993, p. 19. 'Barney' Man in't Veld and Visser 1993, p. 19. 'Dharma' Man in't Veld and Visser 1993, p. 19. = *Strombus* (*Gallinula*) *turritus* Lamarck – Chenu 1859, p. 257, fig. 1599. Martin 1883-1887, p. 143. = *Strombus turritus* Lamarck – Beets 1950, p. 245. Dodge 1956, p. 277. Abbott 1960, p. 113. Cernohorsky 1965, p. 9. Cernohorsky 1972, p. 80. Dance 1974, p. 86. Walls 1980, p. 190. Man in't Veld and Visser 1993, p. 19. = *Doxander turritus* Lamarck – 'de Latil' Man in't Veld and Visser 1993, p. 19.

Strombus (*Doxander*) *vittatus apicatus* Man in't Veld and Visser, 1993, p. 19, pl. 2, figs. 1 - 6. Kronenberg 1998, p. 3. Kreipl *et al.* 1999, pp. 13 and 47, pl. 97.

Doxander operosus Röding, 1798 – Kronenberg and Wieneke 2020, p. 107, figs. 15 and 16.

Distribution. This species ranges from South Myanmar to Vietnam and Central Indonesia (Figure 7A). Literary records – *Bay of Bengal* (Man in't Veld and Visser 1993). *Myanmar* off Sandoway (Man in't Veld and Visser 1993). *Brunei* Kuala Belait (Man in't Veld and Visser 1993); in creek mouth, Anduki (Man in't Veld and Visser 1993); *Thailand* Maikhas Beach Phuket (Abbott 1960); Phuket (Man in't Veld and Visser 1993); Khan Nu Paknam (Abbott 1960); Koh Samet (Abbott 1960; Man in't Veld and Visser 1993); Singora (Abbott 1960); Andaman Sea (Man in't Veld and Visser 1993); Aonang Krabbi (Man in't Veld and Visser 1993); between Si Racha and Pattaya (Man in't Veld and Visser 1993); Chantaburi coast (Man in't Veld and Visser 1993); Kantang (Man in't Veld and Visser 1993); Krabi, Panga Province (Man in't Veld and Visser 1993). *Singapore* (Man in't Veld and Visser 1993); (Chim *et al.* 2009). *Malaysia* Sarawak (Abbott 1960; Man in't Veld and Visser 1993); beach near Luak Bay, Miri, Sarawak (Man in't Veld and Visser 1993); Jesselton, Sabah (Man in't Veld and Visser 1993); Malawalii Channel, Sabah (Man in't Veld and Visser 1993); Maruda Bay (Man in't Veld and Visser 1993); off Sandakan Bay, Sabah (Man in't Veld and Visser 1993). *Indonesia* Biliton (Man in't Veld and Visser 1993); Soengeiliat, Banka (Man in't Veld and Visser 1993); Balikpapan, Borneo (Man in't Veld and Visser 1993); Larantoeka, Flores (Man in't Veld and Visser 1993); Laboean Deli, Sumatra (Man in't Veld and Visser 1993); Atjeh, Sumatra (Man in't Veld and Visser 1993);

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Singkep Island, Sumatra (Man in't Veld and Visser 1993); Djurniang Tjerek, Madoera Island (Man in't Veld and Visser 1993); Madoera Strait (Man in't Veld and Visser 1993); Malacca Strait (Man in't Veld and Visser 1993); off Taganak Island (Abbott 1960); Keledjitan, Banten, Java (Abbott 1960); Tjiperwagaran, Banten, Java (Abbott 1960); Ambonia (Abbott 1960; Man in't Veld and Visser 1993); Hitu (Man in't Veld and Visser 1993); Macassar Straits ('Schepman' in Abbott 1960); Madura Straits ('Schepman' in Abbott 1960); Pulu Jedan, Aru Islands ('Schepman' in Abbott 1960); Japan Island (Abbott 1960); 3-4km south of Makassar, Celebes (Man in't Veld and Visser 1993); Moluccas (Man in't Veld and Visser 1993). *Philippines* Manila Bay (Springsteen and Leobrera 1986; Man in't Veld and Visser 1993); Tayabas Bay, Quezon (Man in't Veld and Visser 1993). Material Examined – *China* South China Sea (VC x 2). *Indonesia* (VC x1); Kangean Islands (SMC x 40). North Malacca Straits (VC x 1). *Philippines* Southern Palawan (SMCx 2); *Singapore* (VC x 3); *Sri Lanka* (VC x 1); Galle (SMC x 1); *Thailand* (SMC x 5; VC x 2); Andaman Sea (VC x 2); Phuket Island (VC x 2). *Vietnam* (VC x 1) Nha Trang (SMC x 2; VC x 2).

Remarks. While it is considered at this time to be only species that typically has consistent strong axial plications on all whorls of the spire, as more material is examined and the ranges of the morphological forms of this species are demarcated, it is highly probable that more than species will be recognised and drawn from this taxon. This species has had a varied taxonomic history, with a variety of names being applied. Hanley (1855) recognised the importance of reconciling the shells in the Linnean Collection with those in the Linnean text to provide a definitive example of each and enable clarity to be brought to the early taxonomy, and consequently recognised two specimens in the collection as "marked" *Strombus vittatus* (Figure 2A). Hanley (1855, p. 273) provided an iconographic reference (Sowerby, 1847, pl. 6, fig. 29) to assist with clarity. These two shells identified by Hanley (1855) in the Linnean Collection were referred to by Abbott (1960) as the *Strombus vittatus* types, however, no lectotype was explicitly designated, and thus they remained part of the broader syntype set for that species. Given the lectotype designation of Man in't Veld and Visser (1993) of Rumphius (1705, 1741) fig. O for *D. vittatus* which is not the high spired taxon, *D. operosus* is the first available name for that taxon.

From their text iconographies, Kiener (1843), Duclos (1844) and Reeve (1851) followed the Linnaean intention to name the elongated highly axially plicated spired shell indicative of his syntype specimens in the London Collection labelled "vittatus", others chose to follow Lamarck (1822) substitute name "turritus" (Abbott 1960; Cernohorsky 1965; Dance 1974; Walls 1980). Man in't Veld and Visser (1993) provided the most recent major revision of the substitute name "apicatus" to replace "turritus", they negated to seek out the Linnaean Collection syntype material; notwithstanding, "apicatus" has recently had popularity in the literature based on that revision (Kronenberg 1998; Kreipl *et al.* 1999; Dekkers and Maxwell 2020).

Doxander vittatus (Linné, 1758)
(Figures 1D, 2 and 12)

Type. Drawing representing the lectotype: Rumphius (1705, 1741) pl. XXXVI, fig. O (Man in't Veld and Visser 1993).

Type Locality. Ambon, Indonesia (Abbott 1960).

Original Description. "S. testar labro rotundato brevi, ventre lævi, spira subnodosa" (Linné 1758, p. 745).

Supplementary Diagnosis. The shell is moderately sized and fusiform. The body whorl

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is smooth with anterior axial incised lines towards the base. The spire with broad even axial spiral ribs being mostly restricted to upper and mid spire, these may be reduced or absent in some specimens. The subsutural chord varies in strength by is well developed on upper whorls. Upper whorls with distinctive striation which diminish as the shell develops, leaving the penultimate whorl nearly smooth. The ventral anterior of the shell extends beyond the base of the dorsum giving rise to an open canal. The base of the shell is moderately reflected. The columella is well developed moderately raised and white. The aperture is while with lirations towards the outer edge. The outer aperture is thickened posteriorly, the remaining being thin.

Synonymy.

Strombus vittatus Linné, 1758, p. 745, no. 439. Linné 1767, p. 1211, no. 508. Gmelin 1791, p. 3517, no. 25, partly. Man in't Veld and Visser 1993, p. 19.

Doxander vittatus Linné, 1758 – Kronenberg and Wieneke 2020, figs. 29 and 30.

Distribution. Known from central Indonesia however it is probable that it ranges further north given the distribution of other stromboidian taxa (Abbott 1960; Figure 7A). Literary records – Ambon, Indonesia (Abbott 1960). Material Examined – *Indonesia* Sumbawa Island, (SMC x 10).

Remarks. A species with a smooth body whorl and arterial canal that terminated below the dorsal outer lip. The Rumphius (1705, 1741, pl. XXXVI, fig. O) image is clear in that the shell is smooth with a feint subsutural chord on the early to mid-teleoconch, and an anterior that terminates below the dorsal outer lip. The morphological similarity to the type image of material from Sumbawa Island and the Rumphius type destination, and shared regional location designated by Abbott (1960), make the Indonesian material here identified the most suitable fit for that species, thus bring taxonomic stability to the taxon. While most examples of this species exhibit a level of spiral axial sculpture, this can be diminished and restricted to the earliest whorls in some examples, or rare examples absent as with the lectotype. Given the lectotypic designation by Man in't Veld and Visser (1993) as a consequence of the failure of prior authors to do so (Hanley 1855, Dodge 1956, Abbott 1960), the supplementary material in the Uppsala Collection (Dodge, 1956), which also forms part of the now redundant syntype set, while informing on the shells Linné had at hand, will not affect the Man in't Veld and Visser (1993) designation.

Doxander queenslandicus Maxwell, n. sp.
(Figures 3 and 13)

Type. Holotype: Dingo Beach, Queensland, Australia, collected 2002, 58.6 mm (SBRF TCMOL0001); Paratype 1 - Dingo Beach, Queensland, Australia, collected 2002, 45.2 mm (SMC16.006a); Paratype 2 - Dingo Beach, Queensland, Australia, collected 2002, 55.9 mm (SMC16.006b); Paratype 3 - Dingo Beach, Queensland, Australia, collected 2002, 53.4 mm (SMC16.006c); Paratype 4 - Dingo Beach, Queensland, Australia, collected 2002, 52.6 mm (SMC16.006d); Paratype 5 - Dingo Beach, Queensland, Australia, collected 2002, 54.5 mm (SMC16.006e).

Type Locality. I designate Dingo Beach, Queensland, Australia.

Description. Shells fusiform with well rounded shoulders that vary from axially plicate with uniform plaits or almost smooth, the penultimate whorl being mostly smooth or with diminished plaits that become obsolete before the smooth body whorl. The shoulder of the dorsal body whorl may have one or two small acute knobs. The ventral body whorl may be flattened and form a large axial fold prior to the dorsum. The columella is well formed and

centrally thickened, forming a short, shallow canal with the outer lip that does not reach the first spiral whorl.

Synonymy.

Strombus vittatus Linné – Kiener 1843, pl. 23, fig. 1a. Sowerby, 1847, pl. 6, fig. 30. Duclos 1844, pl. 25. figs. 1 and 2. Reeve, 1851, pl. 17, fig. 44b. Hinton 1972, p. 6, pl. 3, fig. 15. Hinton 1977a, p. 12, no. 4. Hinton 1977b, p. 9, no. 4. Short and Potter 1987, p. 32, pl. 15, fig. 2. Jansen 1996, p. 19, fig. 57, BC. = *Strombus* (*Gallinula*) *vittatus* Linné – Chenu 1859, p. 257, fig. 1597. = *Doxander vittatus* Gmelin – Iredale 1931, p. 201-235. Allan 1950, p. 100, pl. 17, fig. 11. *Strombus* (*Doxander*) *vittatus* Linné – Rippingale and McMichael 1961, p. 55, pl. 5, fig. 11. Wilson and Gillett 1971, p. 38, pl. 17, fig. 8. Wilson and Gillett 1979, p. 73, pl. 13, fig. 8. = *Strombus* (*Doxander*) *vittatus vittatus* Linné – Cernohorsky 1965, p. 9, pl. 3, fig. 15. Cernohorsky 1972, p. 80, pl. 18, fig. 4.

Distribution. *Doxander queenslandicus* ranges from the Gulf of Carpentaria along the Queensland coast down into northern New South Wales, as well as the island chains that border the eastern Coral Sea west to Fiji and north into Papua New Guinea (Figure 7B). Literature Records – *Papua New Guinea* Gulf of Papua (Hinton 1972). *Australia* Brampton Reef (Abbott 1960); Cape Upstart (Abbott 1960); Port Douglas (Abbott 1960); Townsville (Rippingale and McMichael 1961; Man in't Veld and Visser 1993); Sydney Harbour (Iredale 1931); Dingo Beach (Man in'T Veld and Visser 1993); Innisfail (Man in'T Veld and Visser 1993); Keppel Bay (Man in'T Veld and Visser 1993); Melville Island (Man in'T Veld and Visser 1993). *Vanuatu* Vila Harbour (Cernohorsky 1972). *Fiji* Viti levu (Cernohorsky 1965); Levuka Island ('Smith' in Abbott 1960); Manava Island (Cernohorsky 1972). Material Examined – *Australia* Bountiful Island, Gulf of Carpentaria (SMC x 1); Cook Reef (SMC x 1); Dingo Beach (SMC x 33; VC x 12); Four Mile Beach (SMC x 2); Hope Island (SMC x 4); Keppel Bay (VC x 1); Kurrimine Beach (SMC x 1); Moon Point, Fraser Island (SMC x 1); Pallarenda (SMC x 1); Palm Island (SMC x 3); Pennefather River (VC x 3); Princess Charlotte Bay (VC x 2); Seaforth (SMC x 1); Shelly Beach, Townsville (VC x 2); Shoal Point (SMC x 3); Trawled off Moreton Bay (SMC x 1; VC x 2); Trawled Shelburne Bay (VC x 1); Trawled Tin Can Bay (VC x 1). *Papua New Guinea* (VC x 1).

Remarks. *Doxander queenslandicus* is remarkably stable in morphology and colour, with the most significant variation coming in the form of a darker pattern and rounder shell of southern Queensland and New South Wales. It differs in morphological form from other members of *Doxander*: lacking the strong axial sculpture of *D. vittatus*; the dorsal striations of *D. japonicus*; the stepped spire of *D. entropi*; and lacks the strong subsutural chord with axial flat ribbing of the sympatric *D. campbellii*. *Doxander queenslandicus* can be differentiated from *D. vittatus* as the anterior canal does not extent beyond the base of the dorsum in *D. vittatus,* the base of the shell is also not reflected in *D. vittatus.* The dorsal knob, typical in *D. queenslandicus* is absent or diminished in *D. vittatus*.

CONCLUSION

This revision brings the number of *Doxander* species to six. The designation by Man in' t Veld and Visser (1993) of the Rumphius (1705, 1741) image for the type of *D. vittatus* is problematic when the physical specimens in the London Collection are considered; further complicating this designation is the rare form of the species where the axial plication are absent in the illustration. Notwithstanding, the image

can be identified from the faint upper subsutural chord, fine spiral lines on the upper spire, the lack of a dorsal knob, and especially the posterior canal which extends past the dorsal lip. The new species *D. queenslandicus* is closely related to *D. vittatus* but differs in the termination of the anterior canal at the base of dorsal outer lip and presence of a distinctive knob on the shoulder are two characters that readily differentiate these species.

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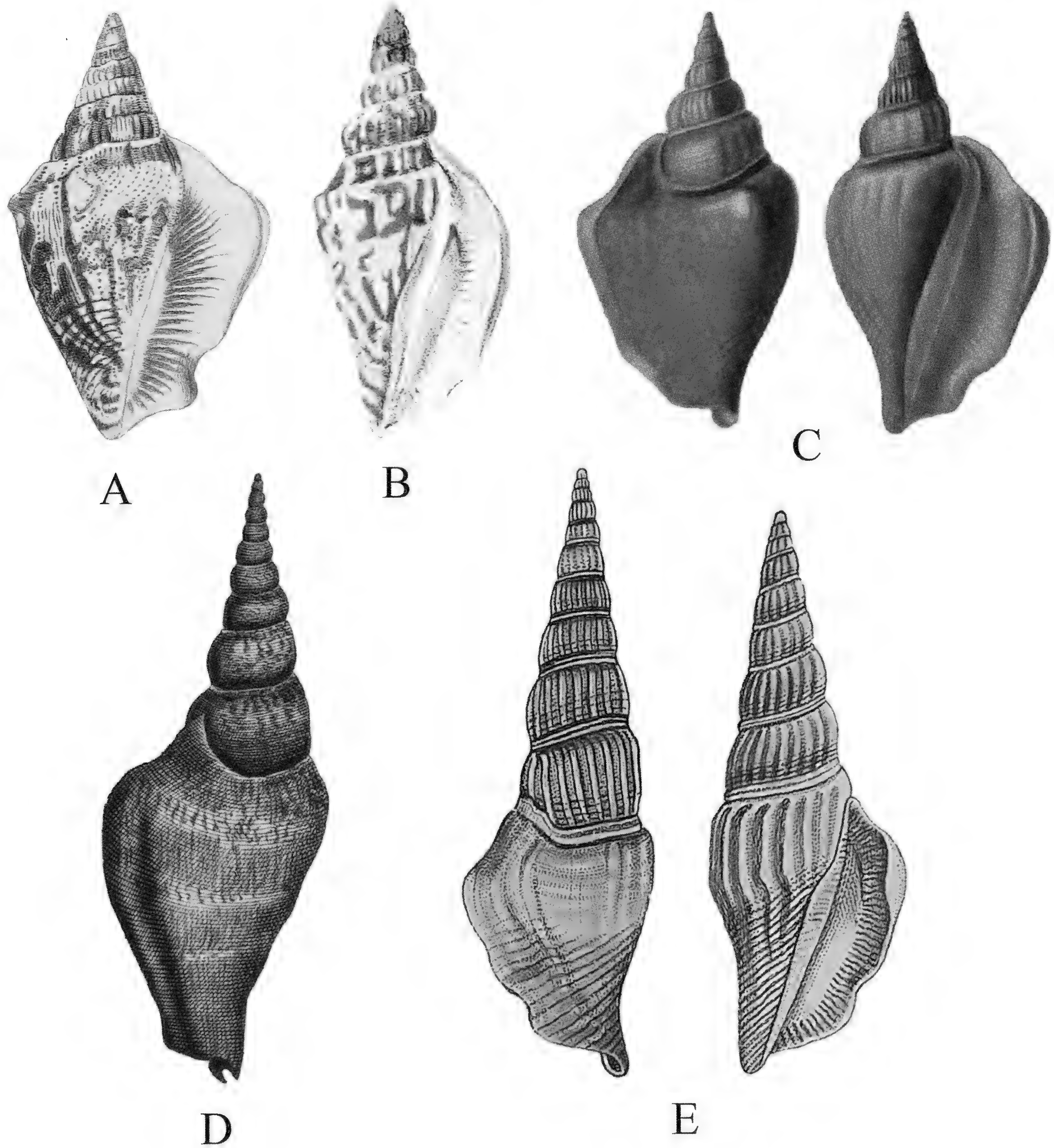

Figure 1. Type material for *Doxander* Wenz, 1940: **A**= Holotype of *Strombus campbellii* Griffith and Pidgeon, 1834, pl. 24, fig. 6; **B**= Holotype of *Strombus japonicus* Reeve, 1851, fig. 42; **C**= drawing representing the lectotype of *Strombus entropi* Man in't Veld and Visser, 1993 (Duclos 1844, pl. 25, figs. 5; **D**= drawing representing the lectotype of *Strombus vittatus* Linné, 1758 (Rumphius 1705, 1741, pl, XXXVI, fig. O), note the fine subsutural chord, spiral lines on the early whorls, the extension of the anterior canal past the edge of the anterior dorsum, and the lack of a dorsal knob. **E**= Drawings representing the lectotype of *Turris operosa* Röding, 1798 (= *Doxander operosus* (Röding, 1798)), Chemnitz (1788, pl. 155, fig. 1482, apertural view; pl. 155, fig. 1481, dorsal view) (Kronenberg and Wieneke 2020, figs. 13a and b).

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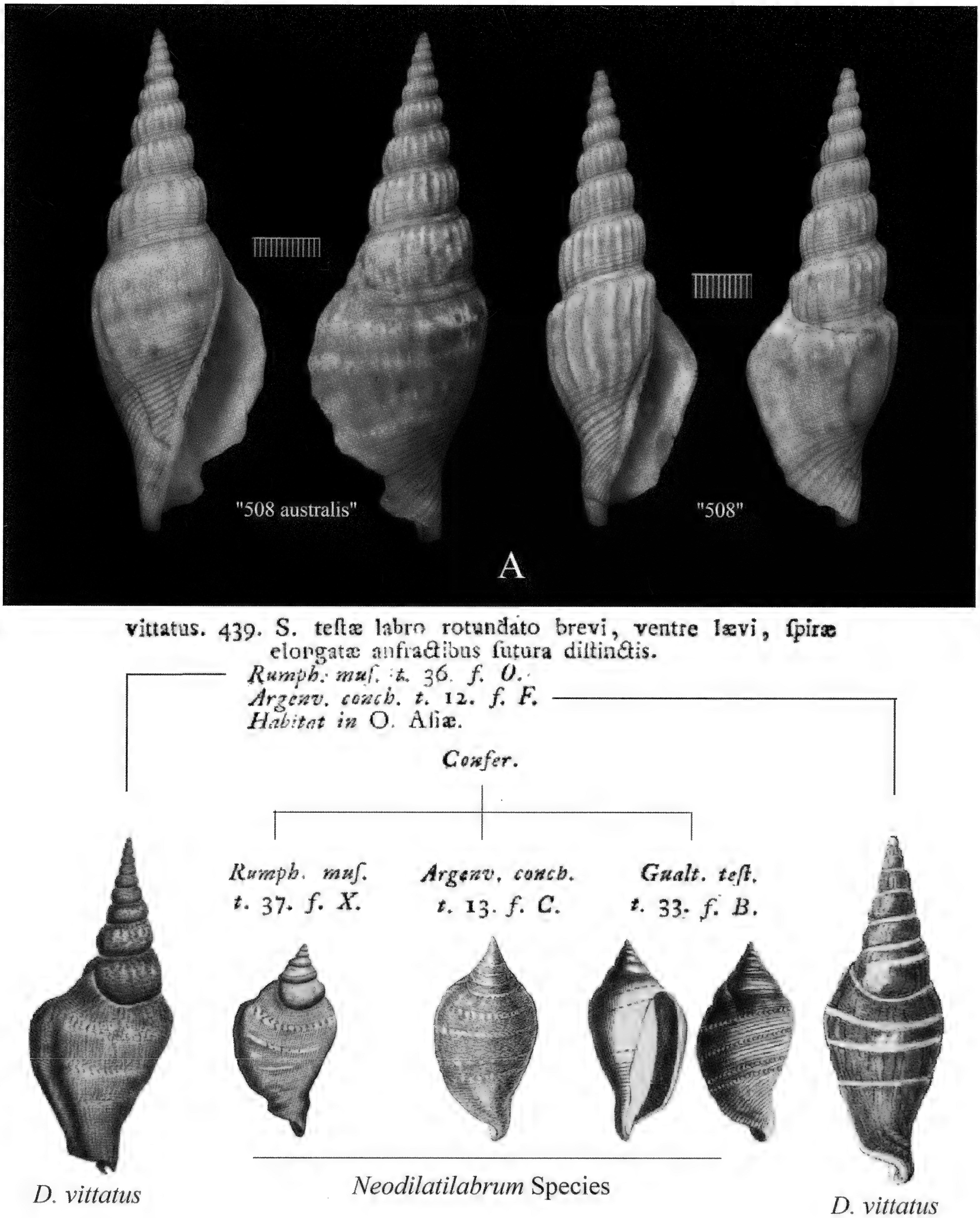

Figure 2. Type material for *Strombus vittatus* Linné, 1758 with the Man in't Veld and Visser (1993) designated Rumphius (1705, 1741) pl. XXXVI, fig. O and others in the type series: **A**= The Linné (Hanley, 1855) syntype material contained in the Linnean Society Collection, London, (LSL 436, PZ 0010906) (= *Doxander operosus* (Röding, 1798)); **B**= The original Linné (1758, p. 745) description with the figures cited in the text with lines indicating the source document.

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Figure 3. Holotype of *Doxander queenslandicus* n. sp., Dingo Beach, Queensland, Australia, collected 2002, 58.6 mm (SBRF TCMOL0001)

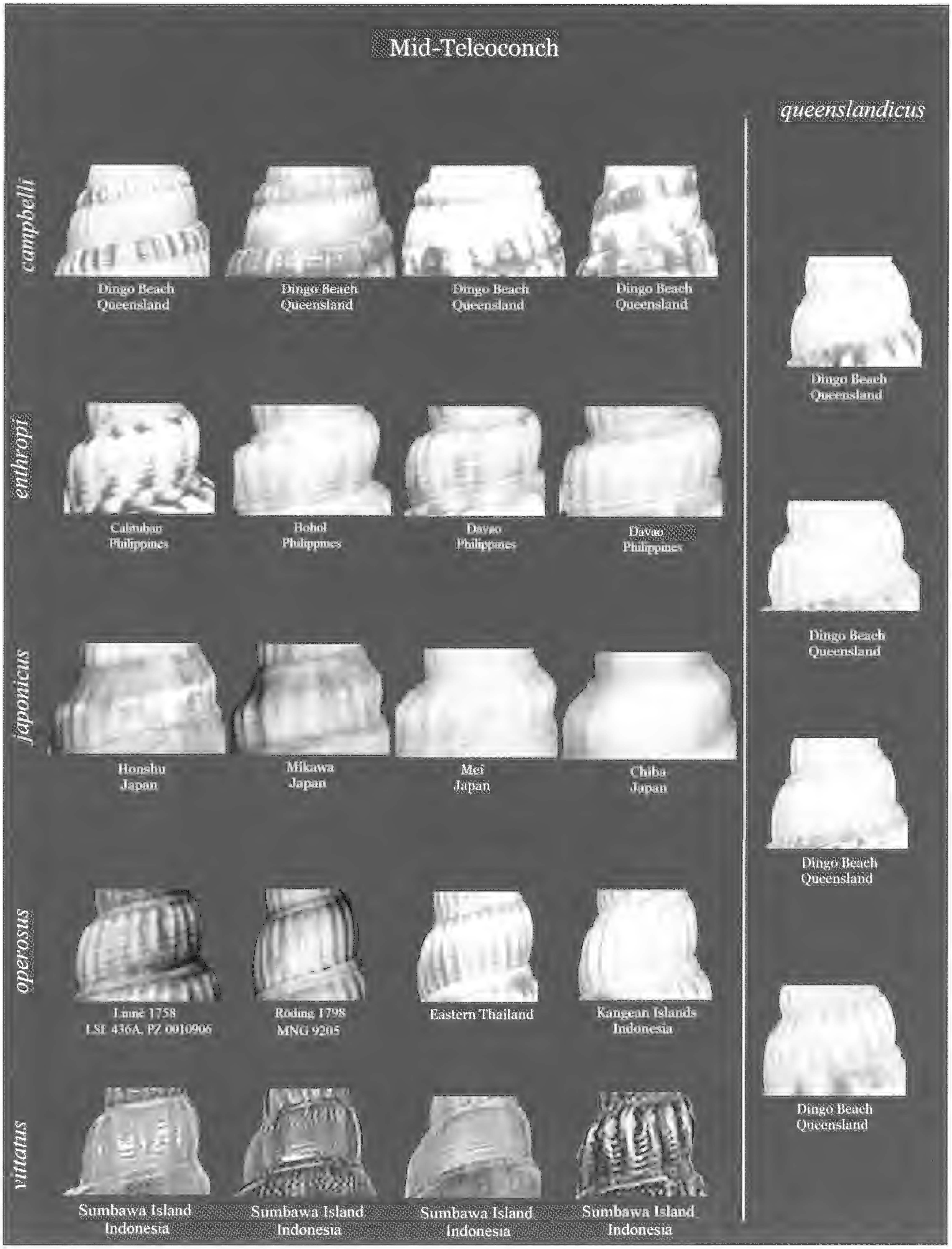

Figure 4. Comparative plate of *Doxander* mid-teleoconchs showing intra-species variability. Note the uniform form of each shoulder, the variability in axial sculpture, which can range from smooth to strongly plicated and should not be considered as a key diagnostic. Note the presence in all specimens of the subsutural chord.

Figure 5. Comparative plate of *Doxander* upper-outer lips showing intra-species variability. Note the form of the posterior canal and form of the outer lip prior to it reflexing axially and becoming calloused.

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Figure 6. Estimated distribution of with locations for literary references (yellow) and material examined (Green) indicated: **A**= *Doxander campbellii* (Griffith and Pidgeon, 1834); **B**= *D. japonicus* (Reeve, 1851); and) *Doxander entropi* (Man in't Veld and Visser, 1993).

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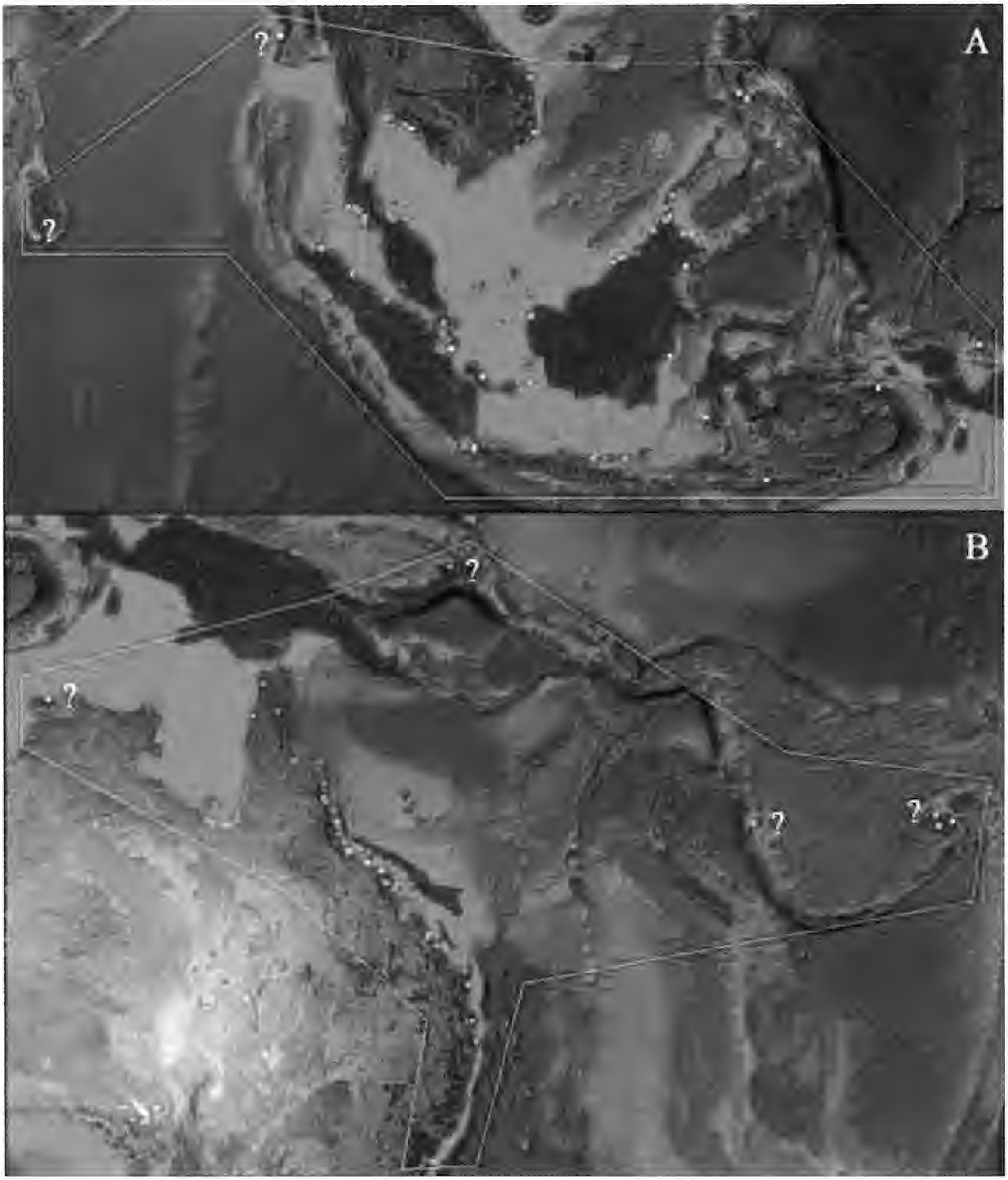

Figure 7. Estimated distribution of, with locations for literary references (yellow) and material examined (Green) indicated: **A**= *Doxander operosus* (Röding, 1798), the estimated distribution of *D. vittatus* (Linné, 1758) is mapped in red; and **B**= *D. queenslandicus* n. sp..

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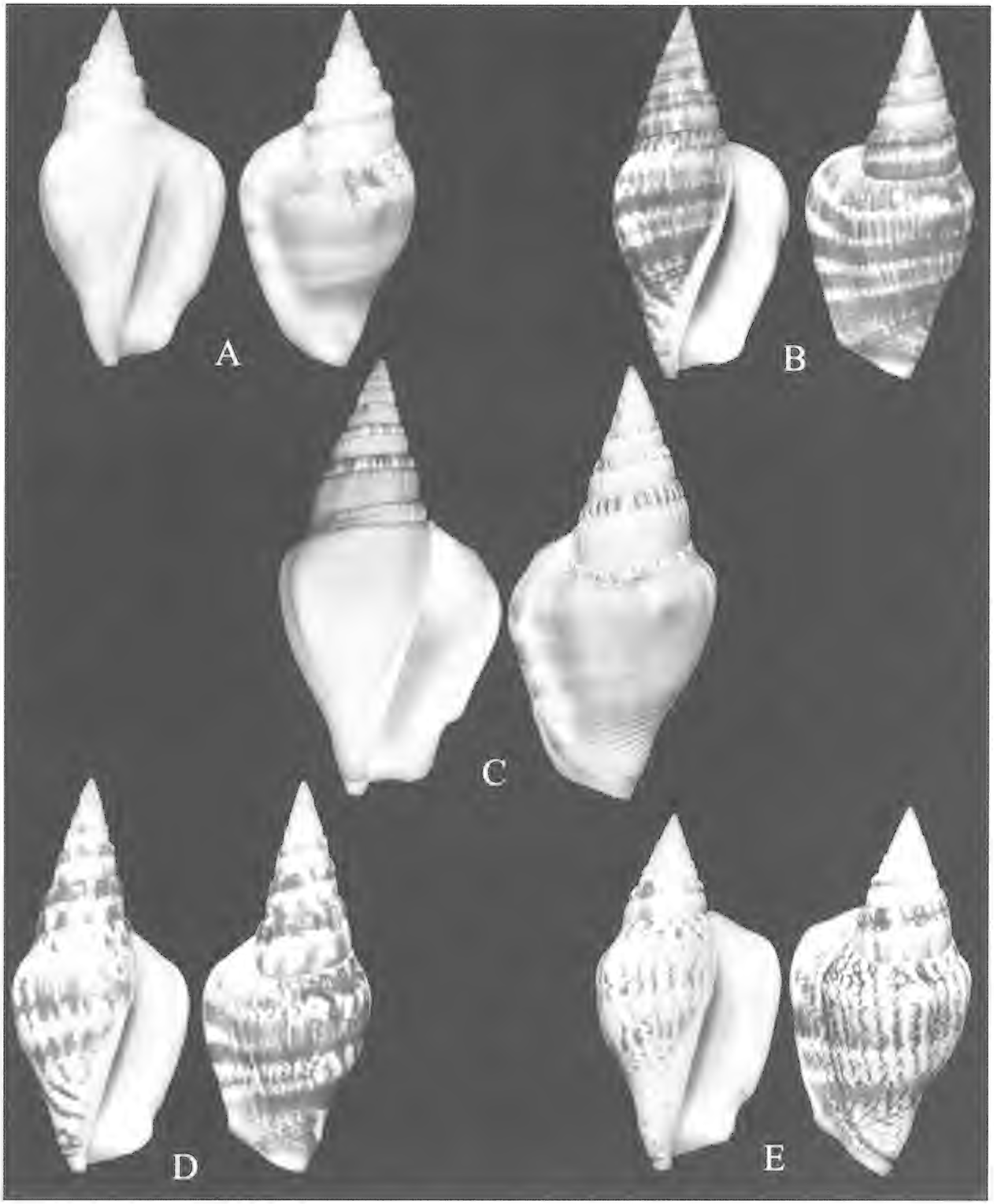

Figure 8. *Doxander campbellii* (Griffith and Pidgeon, 1834) from Dingo Beach: **A**= collected 1992, 42.7 mm (SMC 13.020as); **B**= collected 1992, 42.7 mm (SMC 13.020am); **C**= collected 1992, 53.4 mm (SMC 13.020bf); **D**= collected 1992, 46.9 mm (SMC 13.020b); **E**= collected 2008, 44.0 mm (SMC 13.007g).

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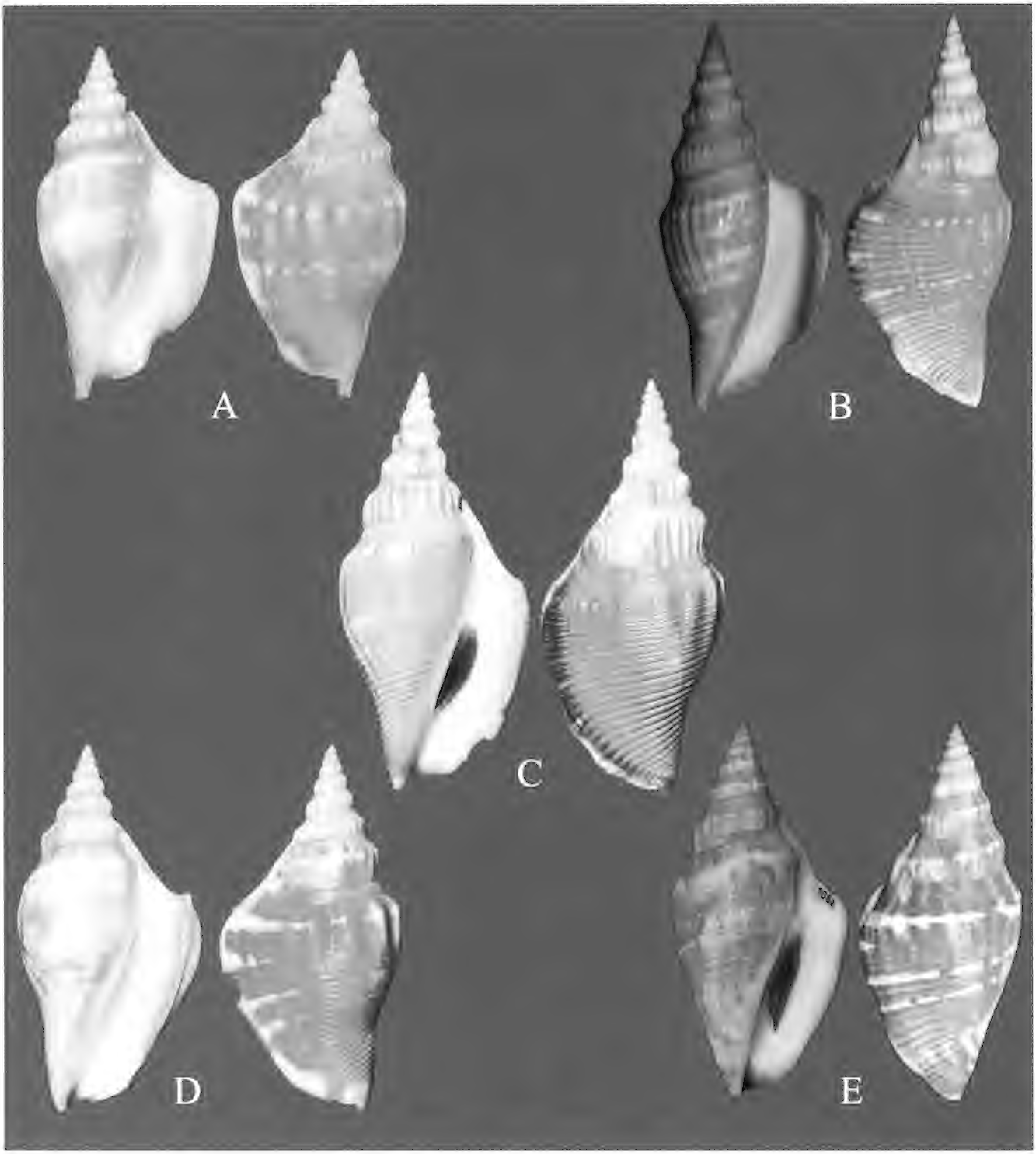

Figure 9. *Strombus japonicus* (Reeve, 1851): **A**= Chiba, Japan, 55.5 (SMC 17.001); **B**= Honshu, Japan, 63.1 mm (Aart M. Dekkers Collection STR1057); **C**= East China Sea, 67.7 mm (VC); **D**= Japan, 58.3 mm (VC); **E**= Mikawa, Japan, 62.8 mm (Aart M. Dekkers Collection STR0540).

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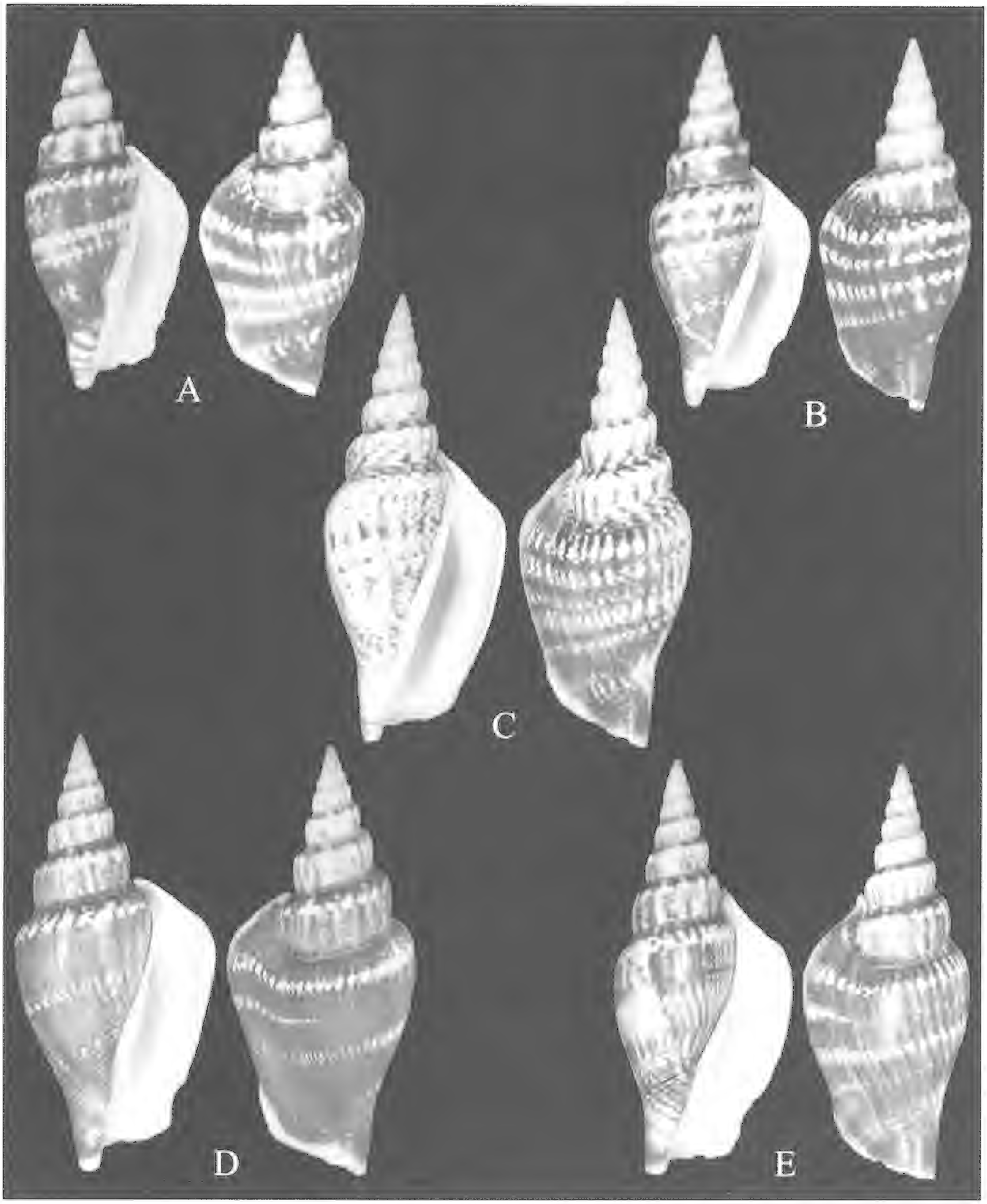

Figure 10. *Doxander entropi* (Man in't Veld and Visser, 1993): **A**= Cebu Island, Philippines, collected 2020, 54.8 mm (SMC 15.004l); **B**= Cebu Island, Philippines, collected 2020, 56.9 mm (SMC 15.004i); **C**= Calituban Island, Philippines, collected 2019, 69.0 mm (SMC 15.003d); **D**= Cebu Island, Philippines, collected 2020, 66.6 mm (SMC 15.004c); **E**= Calituban Island, Philippines, collected 2019, 63.6 mm (SMC 15.003b).

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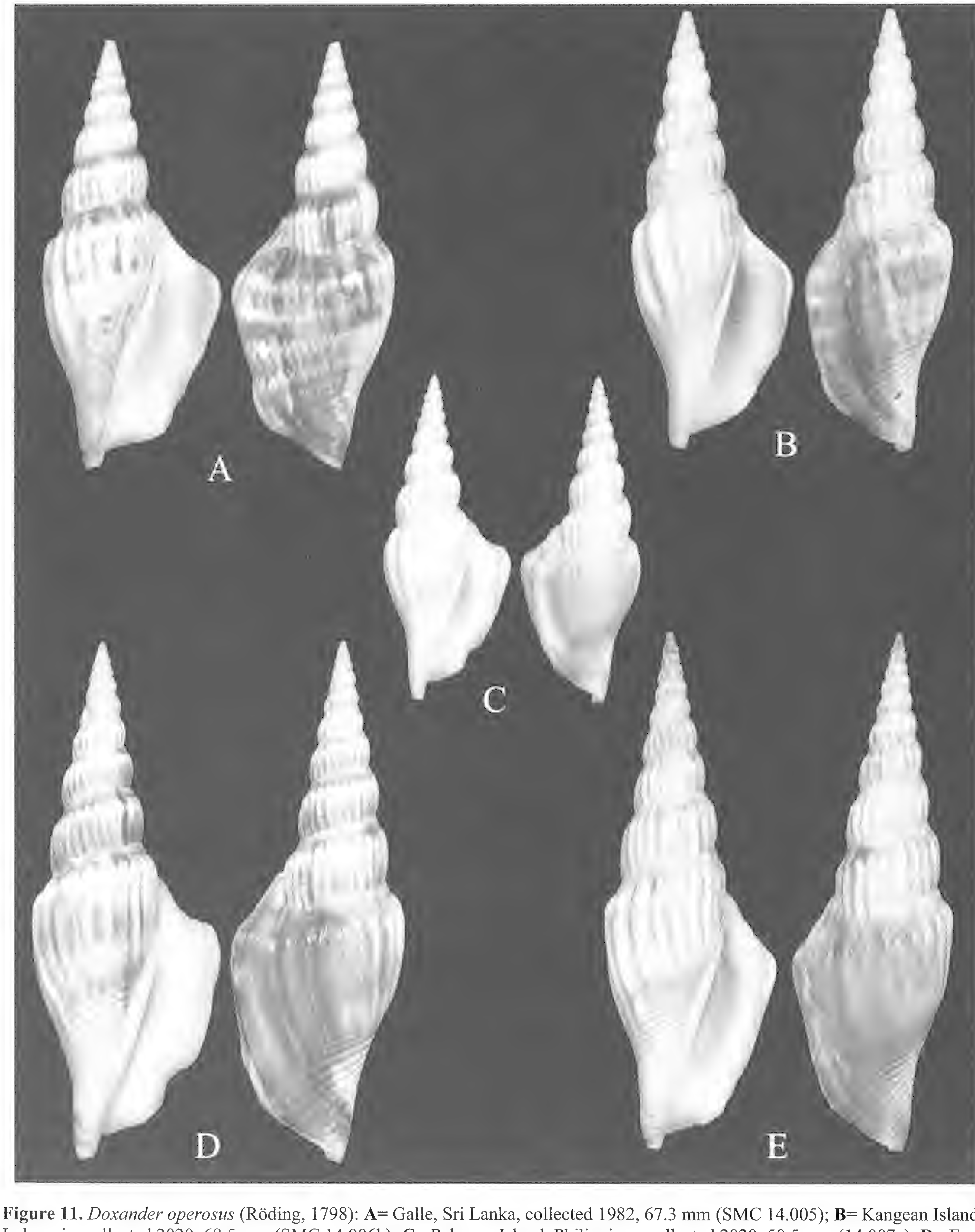

Figure 11. *Doxander operosus* (Röding, 1798): **A**= Galle, Sri Lanka, collected 1982, 67.3 mm (SMC 14.005); **B**= Kangean Islands, Indonesia, collected 2020, 68.5 mm (SMC 14.006h); **C**= Palawan Island, Philippines, collected 2020, 50.5 mm (14.007a); **D**= Eastern Thailand, collected 1993, 80.8 mm (SMC 14.002); **E**= Kangean Islands, Indonesia, collected 2020, 81.5 mm (SMC 14.006l).

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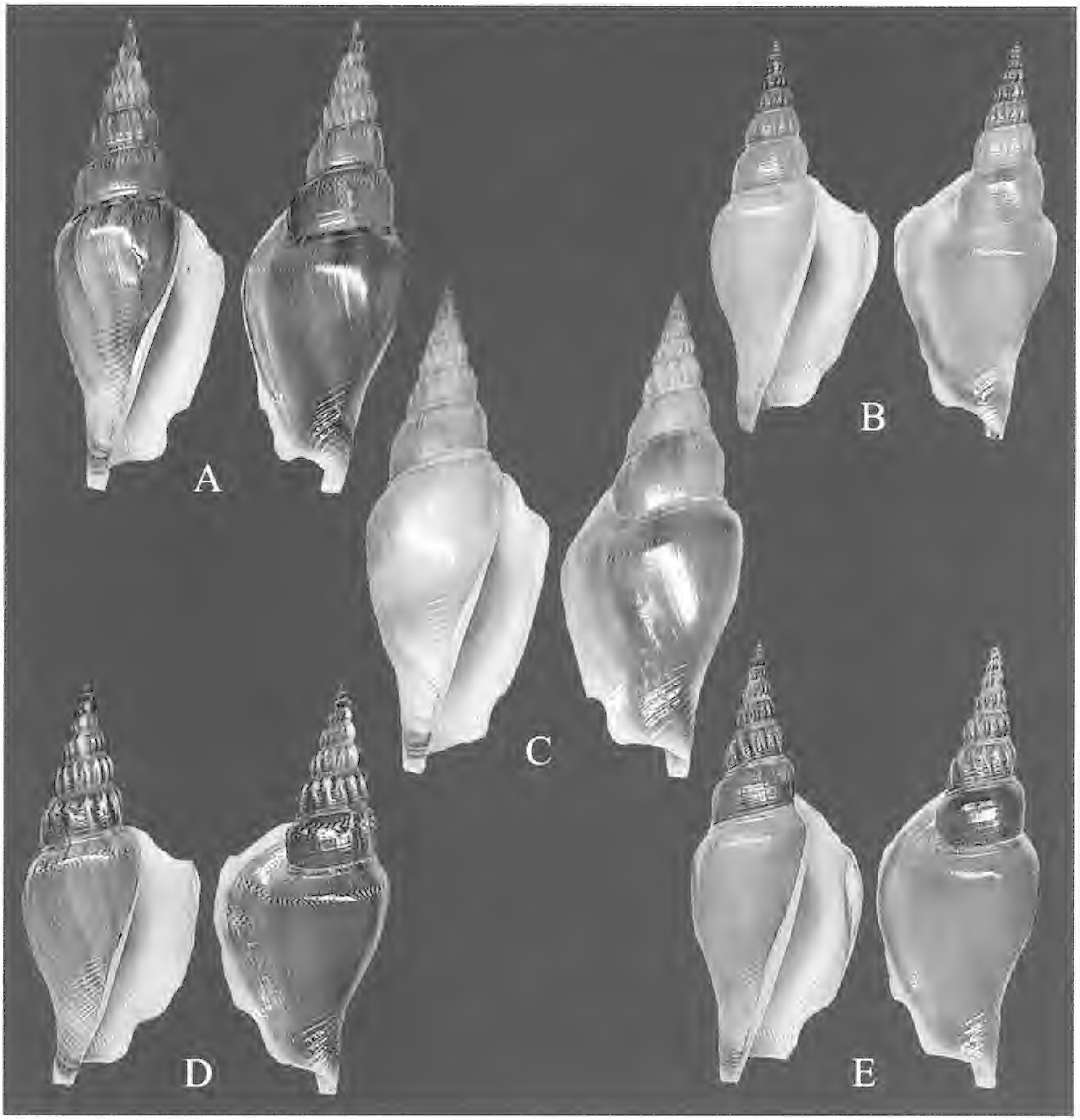

Figure 12. *Doxander vittatus* (Linné, 1758): **A**= Sumbawa Island, Indonesia, 2022 (SMC 14.001a); **B**= Sumbawa Island, Indonesia, 2022 (SMC 14.001b); **C**= Sumbawa Island, Indonesia, 2022 (SMC 14.001c); **D**= Sumbawa Island, Indonesia, 2022 (SMC 14.001d); and **E**= Sumbawa Island, Indonesia, 2022 (SMC 14.001e), size range 55.3 - 69.5 mm.

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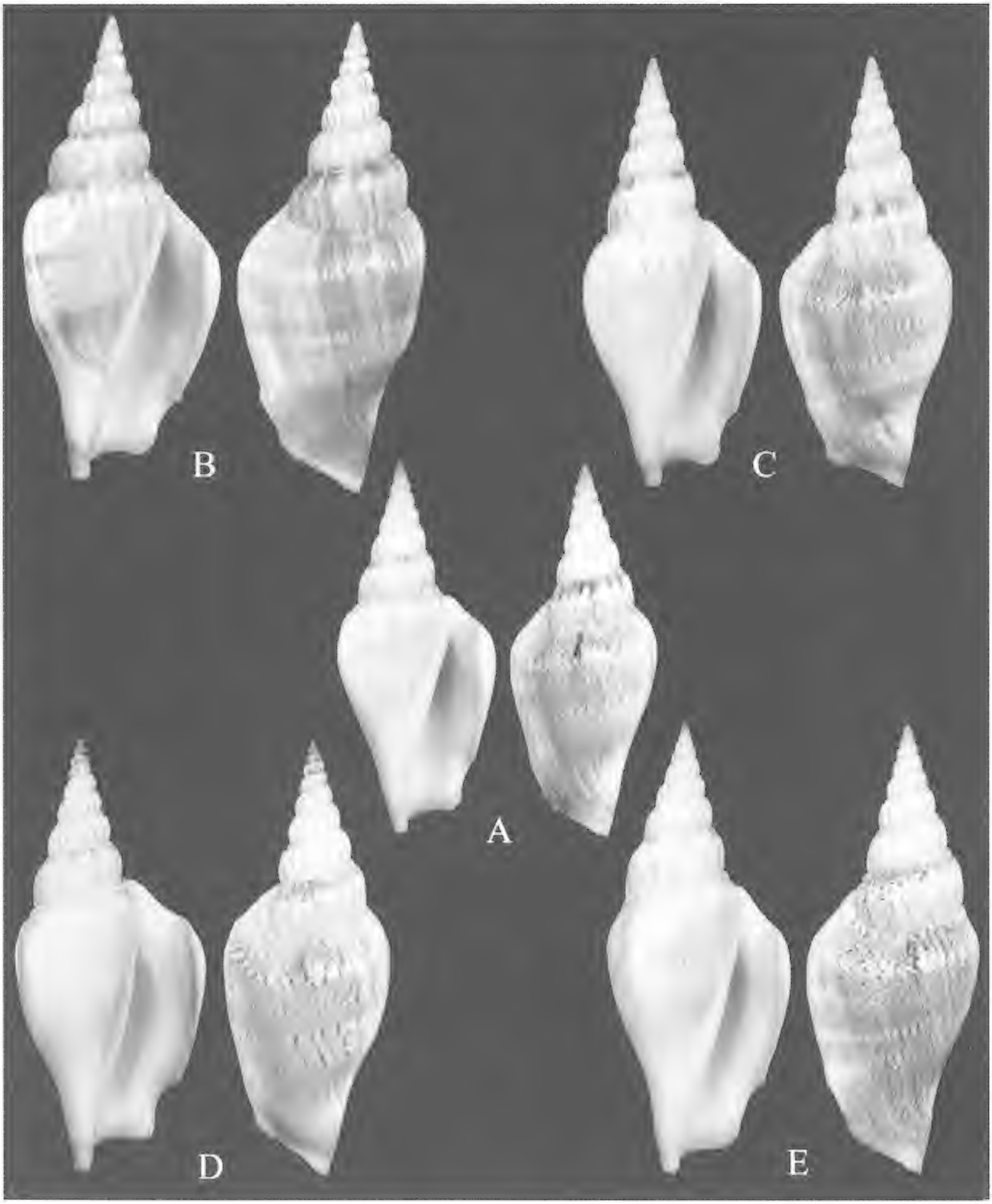

Figure 13. Paratypes of *Doxander queenslandicus* n. sp.: **A**= Paratype 1 - Dingo Beach, Queensland, Australia, collected 2002, 45.2 mm (SMC16.006a); **B**= Paratype 2 - Dingo Beach, Queensland, Australia, collected 2002, 55.9 mm (SMC16.006b); **C**= Paratype 3 - Dingo Beach, Queensland, Australia, collected 2002, 53.4 mm (SMC16.006c); **D**= Paratype 4 - Dingo Beach, Queensland, Australia, collected 2002, 52.6 mm (SMC16.006d); **E**= Paratype 5 - Dingo Beach, Queensland, Australia, collected 2002, 54.5 mm (SMC16.006e).

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A New Species of *Jaspidiconus* (Gastropoda: Conidae) from Aruba

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ABSTRACT A new species of small cone shell, in the conilithine genus *Jaspidiconus*, has been discovered from off the Malmok area of Aruba. The new species, *Jaspidiconus hendrikae*, is morphologically-closest to another Aruban endemic cone, *Jaspidiconus vantwoudti* Petuch, Berschauer, and Poremski, 2015, which was found at Arashi Beach, Noord District, Aruba.

KEY WORDS Aruba, Caribbean Sea, Caribbean Molluscan Province, Aruban Infraprovince, Conidae, *Jaspidiconus*

INTRODUCTION

The Island of Aruba, in the southern Caribbean Sea off the mouth of the Gulf of Venezuela, has long been known to house a rich and highly endemic molluscan fauna (Petuch, 2013: 134-135; Petuch & Berschauer, 2020: 41, 81; Warmke & Abbott, 1962: 14). The species richness is actually so high in the shallow neritic environments around the island that levels of endemism of several gastropod families approach or exceed 50% (*i.e.* 50% in the Conidae, 60% in the Olividae) (Petuch, 2013). This high percentage of endemism demonstrates that Aruba represents a special "evolutionary hot-spot" within the southern Caribbean, which was named the "Aruban Infraprovince of the Grenadian Subprovince, Caribbean Molluscan Province" (Petuch & Berschauer, 2020: 41). Aruba has an extremely high molluscan biodiversity, reflected by over 180 species of mollusks which were collected during a one week field survey by the junior author in Aruba. (Berschauer & Ros, 2014). Some of the more well-known Aruban Infraprovince species include the muricid *Murexiella hilli* Petuch, 1987, the olivids *Americoliva fulgurator fusiformis* (Lamarck, 1811) and *Eburna balteata* (Swainson, 1825), and the conids *Tenorioconus curassaviensis* (Hwass, 1792), *Tenorioconus monicae* Petuch & Berschauer, 2015, and *Jaspidiconus vantwoudti* Petuch, Berschauer & Poremski, 2015, and the endemic genus *Arubaconus* and its single species *A. hieroglyphus* (Duclos, 1833) (all shown here on Figure 2).

Jaspidiconus have proportionately large paucispiral protoconchs, have lechithotrophic benthic development, never dispersing far from where they hatch (Petuch, 2013; Petuch & Myers, 2014). Given the fact that *Jaspidiconus* species have lechithotrophic benthic development, inhabit relatively shallow water, they have limited dispersal capabilities, the genus exhibits a high degree of endemism among the myriad islands and coral cays throughout the Carolinian, Caribbean, and Brazilian marine molluscan provinces (Petuch, 2013; Petuch & Myers, 2014; Berschauer, 2015).

Intensive field work and exploration by the intrepid Aruban collectors Leo G. Ros and Jordy Hendriks have recently uncovered yet another new species of cone shell from the Malmok Beach area on the northern tip of the

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island. This small new species is similar to another Aruban endemic cone, *J. vantwoudti* from the Arashi area, and its discovery indicates that a complex of sibling species of tiny *Jaspidiconus* may be present around the island. This new endemic Aruban animal is described in the following section. The holotype of the new species is deposited in the Los Angeles County Museum of Natural History ("LACM") and bears an LACM catalog number.

SYSTEMATICS
Class Gastropoda
Subclass Sorbeoconcha
Order Prosobranchia
Infraorder Neogastropoda
Superfamily Conoidea
Family Conidae
Subfamily Conilithidae
Genus *Jaspidiconus* Petuch, 2004

Jaspidiconus hendrikae Petuch and Berschauer, new species
(Plate 1, Figures 1 A-D)

Description. Shell small for genus, averaging only around 14 mm, stocky and fusiform, widest across shoulder; spire high, broadly pyramidal, with rounded, convex sides; shoulder angled, bordered by small, rounded carina; body whorl shiny, ornamented with 18-20 incised spiral sulci; low rounded cord present between each pair of sulci; sulci poorly-developed, almost obsolete on posterior one-fourth of body whorl, becoming stronger and better-developed toward anterior end; body whorl colored bright yellow or orange-yellow with scattered, small white patches; single row of small, closely-packed light brown spots on each low, rounded cord; spire white or very pale yellow-white marked with widely-scattered, large red-brown amorphous flammules; shoulder carina white, marked with evenly-spaced row of large dark reddish brown dots; aperture wide, straight, with bright yellow interior; protoconch proportionally very large, prominent, rounded and dome-like, composed of two inflated whorls, orange in color.

Type Material. HOLOTYPE - length 12.09 mm, width 5.92 mm, 7 m depth off Malmok Beach, Aruba, LACM 3811. PARATYPES - length 14.5 mm, from the same locality and depth as the holotype, in the research collection of the senior author; 3 specimens, lengths 7.35 mm to 10.70 mm, from the same locality and depth as the holotype, in the research collection of the junior author.

Type Locality. Found in fine organic detritus in sand pockets, 7 m depth off Malmok Beach, Aruba.

Etymology. Named in memory of Hendrika Wendriks of San Fuego, Aruba; mother of well-known Aruban diver and amateur malacologist, Jordy Wendriks, who collected part of the type material.

Discussion. Of the known Aruban *Jaspidiconus* species, the new Malmok species is similar only to *J. vantwoudti* from the Arashi coast (Figure 1E, F, G, H). Although similar in shape, size, and general body proportions, *J. hendrikae* differs from its Arashi sibling in being a vivid yellow color and not bright pink, in having an orange protoconch and not a bright pink one, in having rows of tiny brown dots on the body whorl, in having a proportionately narrower shoulder, in having a narrower aperture, and in having fewer incised spiral sulci. The two sibling species also differ in their ecological preferences: *J. hendrikae* lives in patches of organic detritus in sand pockets on open sandy seafloors in 5-10 m depths; *J. vantwoudti* prefers high-energy wave surge areas, on exposed rock platforms in 1-2 m depths.

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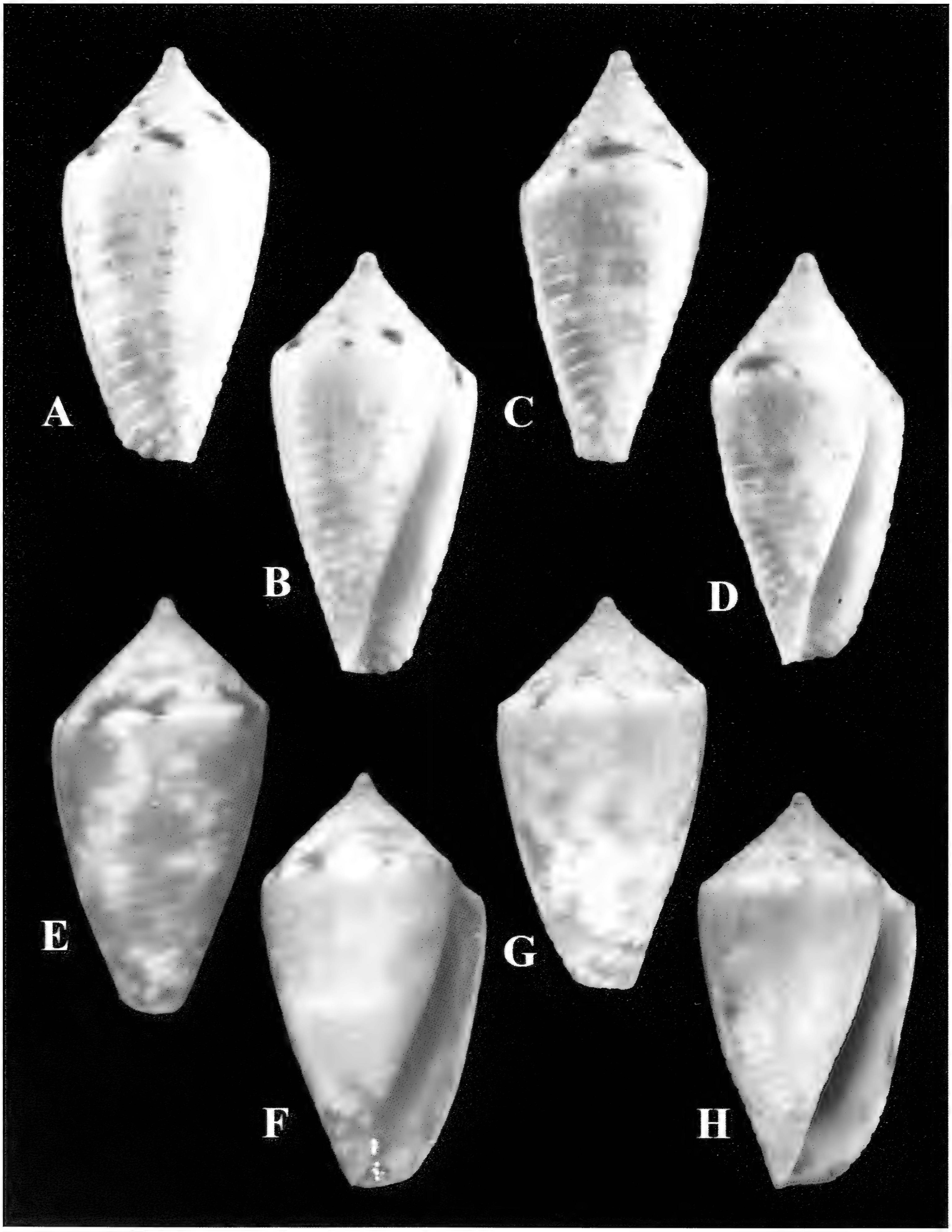

Figure 1. Endemic *Jaspidiconus* species from Aruba.
A, B= *Jaspidiconus hendrikae* Petuch & Berschauer, new species, holotype from Malmok Beach, Aruba, length 12.09 mm, LACM 3811; C, D= *Jaspidiconus hendrikae* Petuch & Berschauer, new species, length 10.70 mm, Malmok Beach, Aruba, in the Berschauer research collection; E, F= *Jaspidiconus vantwoudti* Petuch, Berschauer & Poremski, 2015, holotype, length 12.4 mm, Arashi Beach, Aruba; G, H= *Jaspidiconus vantwoudti* Petuch, Berschauer & Poremski, 2015, length 12 mm, Arashi Beach, Aruba.

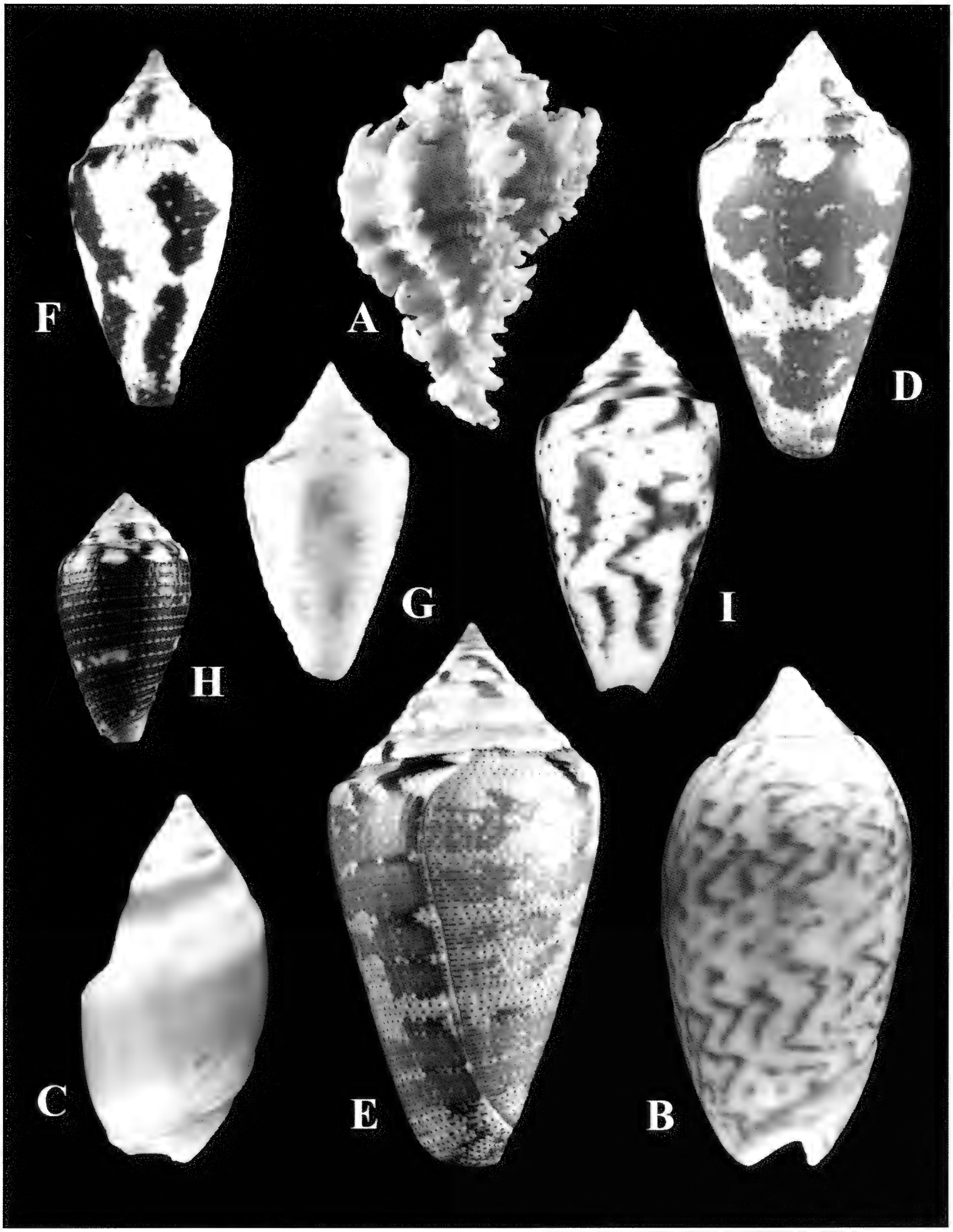

Figure 2. Endemic Gastropods from Aruba and the Aruban Infraprovince.
A= *Murexiella hilli* Petuch, 1987, from Malmok Beach, Aruba, length 35.80 mm; **B=** *Americoliva fulgurator fusiformis* (Lamarck, 1811), from Mangel Halto, Aruba, length 49.05 mm; **C=** *Eburna balteata* (Swainson, 1825), from Mangel Halto, Aruba, length 33.17 mm; **D=** *Tenorioconus curassaviensis* (Hwass, 1792), from Malmok Beach, Aruba, length 33.89 mm; **E=** *Tenorioconus monicae* Petuch & Berschauer, 2015, from Malmok Beach, Aruba, length 60.80 mm; **F=** *Tenorioconus rosi* Petuch & Berschauer, 2015, from Malmok Beach, Aruba, length 15.07 mm; **G=** *Jaspidiconus booti* Petuch, Berschauer & Poremski, 2017, holotype, from Malmok Beach, length 19.70 mm; **H=** *Arubaconus hieroglyphus* (Duclos, 1833), from Malmok shipwreck, Aruba, length 15.16 mm; **I=** *Perplexiconus wendrosi* Tenorio & Afonso, 2013, from Mangel Halto, Aruba, length 15.86 mm.

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Three new Trichotropid gastropods (Capulidae: Trichotopinae) from Alaska

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ABSTRACT Three new hairy snails (Caenogastropoda: Capulidae) are described from Alaskan waters, *Turritropis cryptis* n. sp., *Ariadnaria willetti* n. sp. from the Gulf of Alaska, and *Ariadnaria exiguus* n. sp. from the central and western Aleutian Islands. The new species are compared to similar species from the region.

KEY WORDS Capulidae, *Trichotropis*, *Turritropis*, *T. cryptis*, *Ariadnaria*, *A. exiguus*, *A. willetti*

INTRODUCTION

The family Capulidae is well represented in Alaskan waters, with nine species in six genera. To this total three new species are described, *Turritropis cryptis* Clark n. sp. and *Ariadnaria willetti* n. sp. from the Gulf of Alaska, and *Ariadnaria exiguus* Clark n. sp. from the central and western Aleutian Islands. Previously all species were assigned to the genus *Trichotropis* Broderip & G. B. Sowerby l, 1829, and most prior references to this group are as this genus, however presently several additional genera are recognized. The biology and reproduction of the common *Turritropis cancellata* (Hinds, 1843) (as *Trichotropis cancellata*) was discussed by Yonge, 1962. Clark, 2016 reported brooding behavior by the Arctic *Trichotropis bicarinata* (G.B. Sowerby I, 1825), and the feeding behaviors of three species, *Turritropis cancellata, T. cryptis* Clark n. sp. (as *Trichotropis conica* Möller, 1842) and *Ariadnaria insignis* (Middendorff, 1849) (as *Trichotropis insignis*), were discussed by Iyengar (2007). *Trichotropis cryptis* Clark n. sp. is kleptoparasitic on the tube worm *Serpula columbiana* Johnson, 1901, where it competes with its congener *T. cancellata.* The feeding habits of *A. willetti* n. sp. and *A. exiguus* n. sp. are unknown.

WoRMS, http://marinespecies.com, synonymizes the family Trichotropidae with Capulidae, without subfamily recognition, however I recognize the subfamily Trichotropinae as distinct from Capulinae, by 1) the coiled shell, as opposed to the limpet-like shell of Capulinae, and 2) the presence of and operculum in adult animals, which is lacking in Capulinae. WoRMS also synonymizes *Turritropis* with *Trichotropis*, but *Turritropis* is here recognized as distinct and valid, differing in having both axial and spiral sculpture. Axial sculpture is lacking in *Trichotropis*, which is sculptureless save for two strong spiral cords or angulations.

ABBREVIATIONS

LACM, Natural History Museum of Los Angeles County, Malacology Department.
SBMNH, Santa Barbara Museum of Natural History.
NOAA, National Oceanic and Atmospheric Administration.
NMFS, National Marine Fisheries Service (Alaska Fisheries Science Center)
OD, original designation
RNC, Reference collection of the author.
USNM, National Museum of Natural History (Smithsonian)

SYSTEMATICS

Family: Capulidae Fleming, 1822
Subfamily: Tricotropinae Gray, 1850
Turritropis Habe, 1961

Type species: (OD) *Turritropis cedonulli* [*sic*], of Habe, 1961:36 (not *Trichotropis cedo-nulli* A. Adams, 1860)] [= *Turritropis turrita* Habe, 1962]. Shikoku, Japan).

Turritropis cryptis Clark, new species
(Figures 1-2)

Trichotropis bicarinata, non Sowerby: Cowan, 1964: 112
Trichotropis conica, non Möller: Baxter, 1987: 57; Iyengar, 2008: 57.

Description. Profile tall, with 5-6 whorls, bicarinate, spiral sculpture of strong, broad shoulder and basal cords, with one smaller secondary and 2-3 much finer tertiary cords between; subsutural ramp with five fine cords; base with six similar cords. Axial sculpture of 10-13 undulations, forming rectangular cancellations on spire. Periostracum bearing strongly projecting, spinose tufts on shoulder and basal cords. Height to 22.0 mm, holotype 16.1 mm.

Type material. Holotype: LACM 3791 (*leg.* RNC, 4 October, 1993; SCUBA), Paratypes: 5 (wet), LACM 3792; 3, LACM 3793 (dry); 1, (ex—LACM) SBMNH 184001; 3, RNC 3523.

Additional material. 1, RNC 3937, Eider Point, Unalaska Id., Alaska; 3, RNC 3971, Eider Point, Unalaska Island, Alaska, 10 m; 2, RNC 3630, Chiniak Bay, Kodiak Island, Gulf of Alaska, 5 m; 1, RNC 4421, Auke Bay, SE Alaska, 15 m; 1, RNC 3426, Sitka, Baranof Island, SE Alaska; 3, South Sukoi Island, Frederick Sound, SE Alaska, 10 m; 1, RNC, 3510, Petersburg, Mitkof Island, SE Alaska; 1, Prolewy Point, Kupreanof Island, SE Alaska; 1, Nicholes Bay, Prince of Wales Island, SE Alaska, 46-58 m; 2, RNC 3522, Tatoosh Islsnd, SE Alaska, 18 m; 1, RNC 3526, Mountain Point, Revillagigedo Island, SE Alaska, 20 m; 3, RNC 3576, Mountain Point, Revillagigedo Island, SE Alaska, 10 m; 1, RNC 4526, Ogden Point breakwater, Victoria, Vancouver Island, British Columbia, Canada, 14 m.

Type locality. Washington Monument, pinnacle, approximately 53 km SE of Ketchikan, Revilagigedo Island, SE Alaska (55º03 N, 131º02 W), 15 m.

Distribution. Eider Point, Unalaska Island, Fox Islands, Aleutian Islands Alaska (53º57.5 W, 166º35.4 W), east and south to Victoria, Vancouver Island British Columbia, Canada (48º25.7 N, 123º21.9).

Habitat. sublittoral, 3-58 m, on the calcareous tube worm *Serpula columbiana* Johnson, 1901.

Etymology. From the Greek, *kryptos*, hidden.

Remarks. Differs from *Turritropis cancellata* (Fig. 3) in in its bicarinate rather than rounded profile, and the fewer and much longer periostracal extensions. Baxter, 1987 listed *Trichotropis conica*, but was undoubtably referring to this species.

Ariadnaria Habe, 1961

Type species. (OD) *Trichotropis borealis* Broderip & G.B. Sowerby l, 1829). *Oceano boreali, prope Insularum Melville dictam* (near Melville Id., Arctic Ocean) (Broderip and G.B. Sowerby I, 1829:375).

Ariadnaria exiguus Clark, new species
(Figures 4-5)

Description. Shell small, to 14.5 mm (Holotype), poorly calcified; whorls five, Protoconch paucispiral, first teleoconch whorl rounded with numerous fine spiral fine striae; profile rounded, periostracum thin, suture impressed, final whorl slightly enlarged relative to previous whorls; spiral sculpture of two low, broad cords, one at the shoulder, the other at the base; axial sculpture of sharply raised, opisthocline growth lines, forming very fine, low laminae; umbilicus, reduced to a tight chink. Periostracum forming ridges on spiral cords, and bearing well-spaced, long bristle-like extensions. Some juvenile specimens have a single, smaller secondary spiral cord between the shoulder and basal cords, when present, this cord lacks periostracal extensions.

Type material. Holotype LACM 3809 (*leg.* RNC, 23 July, 1997; trawled); Paratypes: 1, LACM 3810; 1, SBMNH 184005;1, RNC 3983. (Paratypes from type locality).

Additional material. 7, RNC 3981, 4.5-9.0 mm, S of Attu Island, Near Islands, Aleutian Islands, Alaska (52°29.3 N, 172°57.5 E), trawled, 166 m on gravel (NMFS 23-1997-1-210); 1, RNC 4541, 8.3 mm, Petrel Bank, NE of Semisopochnoi Island, Aleutian Islands, Alaska (52°30.8 N, 179°31.1 W), trawled, 141 m (NMFS 94-2002-1-181).

Type locality. North end of Adak Strait, Andreanof Islands, Aleutian Islands, Alaska (51°54.6 N, 176°52.4 W), 212 m. (NMFS 23-1997-1-171).

Distribution. Central and western Aleutian Islands, Adak Strait (176°52 W) to S of Attu Island (172°57 E).

Habitat. 166-212 m, on gravel and small rocks.

Etymology. From the Latin *exiguus*, poor or scanty in reference to its small poorly calcified shell.

Remarks. This shell at first resemble a juvenile *Trichotropis bicarinata*, but lacks the biangulate whorls and thick periostracum, has well-spaced periostracal extensions, and has axial sculpture. It also bears close resemblance to *Turritropis willetti* Clark n. sp., but has a broader profile, and lacks the secondary spiral cords forming cancellations. The two are separated by more than 2700 km.

Ariadnaria willetti Clark, new species
(Figure 6)

Trichotropis conica, *non* Möller: Dall, 1921: 148; Oldroyd, 1927: 39.

Description. Shell small, to 13.2 mm (Holotype), whorls five, profile rounded, periostracum thin, suture impressed, final whorl slightly enlarged relative to previous whorls; spiral sculpture of variable strength cords, the strongest defining the shoulder and base; two cords of lesser strength between major cords, base also with cords of lesser strength. Axial sculpture lacking except for sharply raised, opisthocline growth lines, producing fine cancellations with spiral striae when viewed under magnification. Umbilicus represented by tight chink. Protoconch paucispiral, first teleoconch whorl rounded with numerous fine spiral cords.

Type material. Holotype, USNM 216358, Paratype, LACM 3794.
Type locality. Forrester Island, SE Alaska (approx. 54°48 N, 133°30 W)

Distribution. Known so far only from the vicinity of Forrester Island, SE Alaska (54°48 N, 133° W). Known only from the type material.

Habitat. Sublittoral, 90 m.

Etymology. Named for the late George Willett [1879-1945] (LACM Mammology/Orinthology), who collected the type specimens.

Remarks. The paratype specimen (11.1 mm) has an additional strong cord between the two main cords and has a broader umbilical chink due to a growth injury. Differs from the Arctic-Atlantic *Ariadnaria conica* (Möller, 1842) (Fig. 7) in having a less rounded profile, and bearing a prominent mid-whorl rib. Resembles *Ariadnaria exiguus* Clark n. sp., but differs in having secondary spiral striae, and less prominent growth lines, which form cancellations, however similarities between these two species are impressive, and it is not impossible that they represent extreme forms of the same species, however given the great geographical separation (2700 km), and material from between the type localities is lacking, despite much searching (many thousands of samples), they are considered provisionally distinct.

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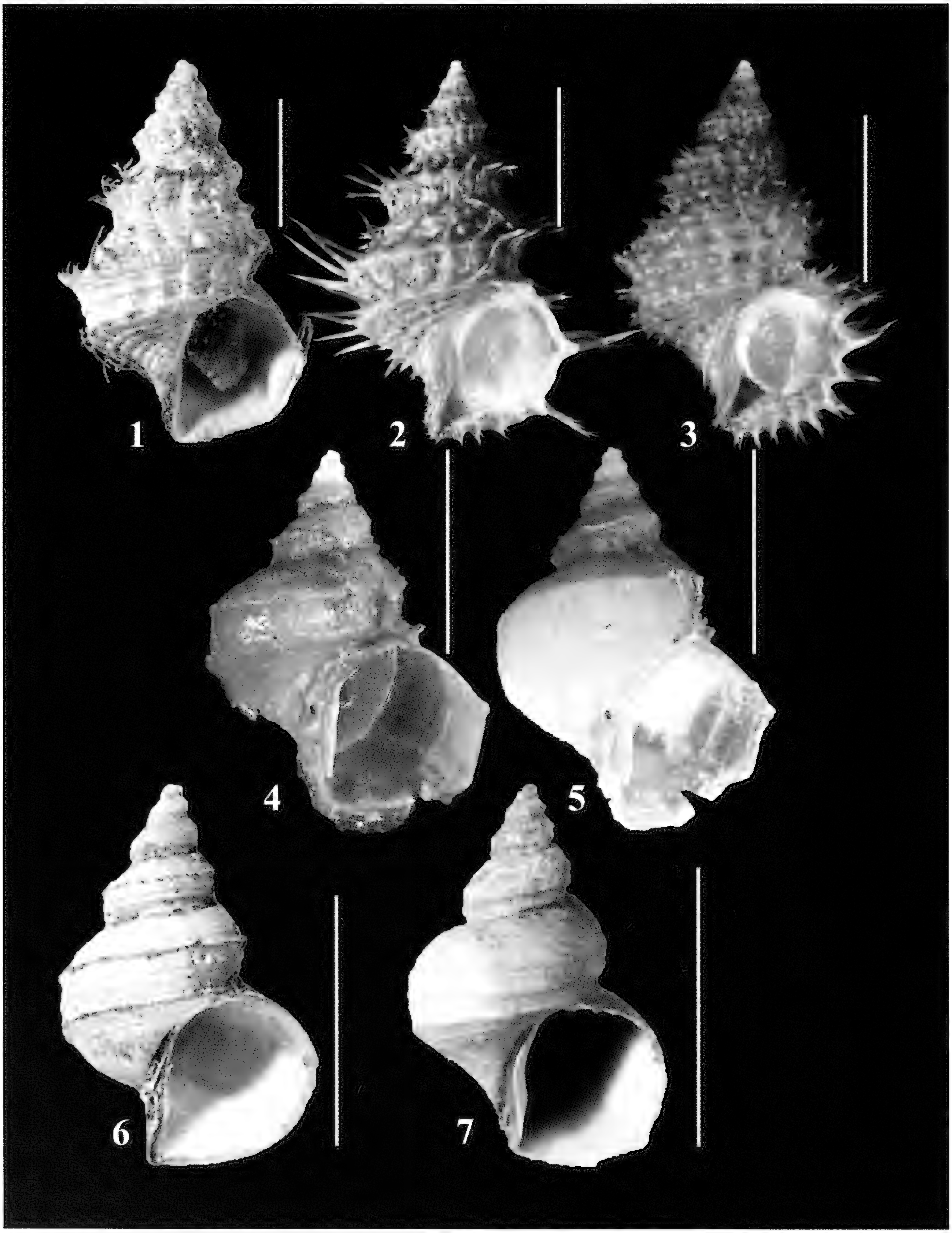

Figures 1-2= *Turritropis cryptis* Clark, n. sp.; 1, Holotype, LACM 3791, 2, Paratype, RNC 3523; **Figure 3**= RNC 3686 *Turritropis cancellata* (Hinds, 1843), Sitka, Alaska; **Figures 4-5**= *Ariadnaria exiguus* Clark, n. sp., Holotype, LACM 3809, periostracum removed to view sculpture in Figure 5; **Figure 6**= *Ariadnaria willetti* Clark, n. sp., USNM 216358; **Figure 7**= *Turritropis conica* (Möller, 1842), LACM 152831, Arctic Ocean, Kara Sea, Russia. Scale bars = 1 cm.

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ERRATA

The genus *Arctomelon* Dall, 1915 in Alaskan waters, with the description of a new species. R.N. Clark (2018) The Festivus 50(4):256-263

Roger N. Clark
Research associate: Santa Barbara Museum of Natural History,
and Natural History Museum of Los Angeles County

In my paper "The genus *Arctomelon* Dall, 1915 in Alaskan waters, with the description of a new species. R.N. Clark (2018) The Festivus 50(4):256-263. I incorrectly composed the name of a new species of *Arctomelon,* as *A. borealis*, which is masculine or feminine. However the genus *Arctomelon* is neuter, so the species name must be neuter also. The correct designation should be *Arctomelon boreale.* I am grateful to Dr. Jann E. Vendetti of the Natural History Museum of Los Angeles County (LACM) for bringing this to my attention. This correction has already been addressed in the World Register of Marine Species (WoRMS).

Cite as: Clark, R.N. 2022. ERRATA: The genus *Arctomelon* Dall, 1915 in Alaskan waters, with the description of a new species. R.N. Clark (2018) The Festivus 50(4):256-263. The Festivus 54(2):179. DOI:10.54173/F542179

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Have a shell collection you would like to donate to The San Diego Shell Club?

The San Diego Shell Club is interested in your shell collection. As a 501c(3) organization, all donations to our Club may provide a tax write-off. When we receive a donation we provide a letter describing the items that may be used when filing your taxes. While we cannot provide a value, donations of up to $5,000 do not require a written appraisal. Since tax laws change regularly we recommend that you check with your tax accountant before relying on any information provided here.

We are interested in all types of shells, marine or land and all genera and species, including books on shells as well as items related to shells such as artwork, storage cases and tools. Your donated items will be used to generate income to support the Club's efforts in continuing Public education about shells and conservation of marine life throughout the world. If you would like to donate, please contact David Waller, SDSC Acquisition Chairperson, by email at dwaller@dbwipmg.com to schedule a time to discuss charitable gifting.

CLUB NEWS

2022 February - General Meeting
Canceled due to Covid-19 concerns and restrictions.

2022 March - General Meeting
The March presentation was given by David P. Berschauer on the *Muexiella* of the Carolinian, Caribbean and Brazilian marine Molluscan Provinces, and was done over Zoom and had a great attendance. Robyn Waayers recorded the presentation and placed a link on the Club's website. https://us02web.zoom.us/rec/play/7UAPmDbQwun0Mo0hXrq8x2is2aM0bpVX53hVVkeuyD5DbqofuLLV1Xf_NVurPEzCcZYRLox_RONvqHw.0ZGvsYcfuDS7DRpV?continueMode=true

April 2022 - Spring Auction
The April Auction was held at the home of Larry and Debbie Catarius, and featured the shells of the Ring Legacy Collection. There were many beautiful specimens available from this vast collection, and all found new homes after much spirited bidding in the verbal and silent auctions.

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Volume: 54 THE FESTIVUS ISSUE 2

Unique Gastropods from Mission Bay, San Diego

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Mission Bay (MB) is rather unique as it was transformed into a marine park during the late 1940s and early 1950s. With the exception of recreational and sport fishing boats, hotels, and Sea World, there has been no commercial shipping or industry on the bay or its shores. The channel is lined with rocks and dredged to a depth of approximately 30 ft, with the range of depths in the front half of the bay (out of the channel) is 12 to 20 ft; the back of the bay is both shallower and warmer.

Oceanic conditions in the channel extend to the West Mission Bay bridge, a distance of approximately 1.5 miles. During La Nina years the water may be cool enough to support giant Kelp along the rocky margins of the channel. Summer water temperatures typically reach 75°F, and are 80°F during an El Nino. A strong El Nino allows diving without a wet suit from May to early November. Average UW visibility in the outer bay is 15-25 ft.

I am fortunate to live just a few minutes from many of my study sites and have worked on gastropod biology for more than a decade. During that time, I have found a number of exceptional shells, both common and unique. My diving is mostly in the front half of the bay with numerous diverse habitats. The back half of the bay is sand, silty-sand, and eel grass with low gastropod diversity.

The MB survey identified 187 species of mollusks in the bay, and the number of opisthobranchs and, chitons species were probably under counted. This article, reviews six species of interesting gastropods, which I have separated by habitat, and provide both depth and location data.

Sand. The large Murex, ***Forreria belcheri*** (Hinds, 1843) has been common at time and then disappear for years, with only juveniles occasionally found. The adults are very mobile and feed on bivalves. In the bay they target species such as *chione undatella* (Sowerby, 1835) which are found on the surface of clean sand or just below the surface. As a result, *F. belcheri* are either buried/partially buried or on the surface of the sand at depths from 3 to 30 ft. Those snails that are buried in the sand can be spotted by the tuft of red algae protruding from the sand as the algae only grows on a hard surface. Figures 1a & 1b illustrate a *F. belcheri* in habitat and a cleaned shell (131 mm) with all spines intact.

When an adult is found, there are usually additional individuals in the same area. The snails move out of an area after significantly reducing the population of the preferred bivalves. The largest quality specimen that I retained is 166.5 mm in length. If you are fortunate to find this species, consider leaving any individuals with damaged/missing spines or a broken syphon to reproduce.

Neosimnia barbarensis (Dall, 1892) has an amazing mantle (Figure 2a), and is found in the outer bay on the sea pen host or on the sand surface within the sea pen colony. All specimens observed in

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the bay are associated with *Acanthotilus sp*., a tall, slender white sea pen (Figure 2b.) In the bay, the snails have not been observed on various species of gorgonians utilized by *N. vidleri* (Sowerby, 1881). The sea pen lives with the peduncle buried in clean sand to hold them against the notable current. They are usually at depth of 15-30 feet, in or along the edge of the main channel and have not been observed in the various bay and coves within MB. This was an unexpected find, as literature suggests this is a deep-water species. The female average 35 mm, with the largest at 40.8 mm, males are smaller (average 31.3 mm) and their shell slightly darker. Both males and females attend the eggs which are usually deposited near the apex of the sea pen. At times the species can be common, but the snail disappears if the sea pen population crashes. Finding them is best attempted on a drift dive during an incoming tide.

Sand Rock Interface. Dead specimens of ***Crossata californica*** (Hinds, 1843) formally *Bursa* (Figure 3) are found along the rock-sand interface at approximately 30 ft. Live individual are on rock substrate, typically below 26 ft. Most specimens found in the bay are juveniles, 65 mm or less in height, while off-shore mature shells are commonly 95 - 105 mm and some are much larger. The most dependable location to find this species in MB has been the rock-sand habitat just south of the entry to Quivira Basin.

Neotiara fultoni (Smith, 1892) formally *Mitra* (Figure 4). Three species of Miter occur in Mission Bay. *Neotiara fultoni* is uncommon in Southern California. A live specimen was found on an isolated rock on the edge of the dredged channel at 25 feet off Hospitality Point, it measures 35 mm in height. The shell was labeled but no identification was attached. A trip to the malacology department at the Los Angeles County Museum of Natural History confirmed its identity as *N. fultoni* and its known but infrequent occurrence in southern California. While under water, it is difficult to distinguish *N. fultoni* from *Atrimitra idea* Melvill 1893, until the aperture is examined.

Tegula regina (Stearns, 1892). This is the largest species of *Tegula* in southern California (Figure 5). The species is common off-shore on rock surfaces below 55 feet. In MB. *Tegula regina* is found with some regularity among rocks at 15-20 feet on the channel side of the south jetty. One was also found in the back half of the bay at low tide among rip-rap on the SW corner of Fiesta Island. There is a great deal of variation in the color and pattern of the shells, from black to ivory and with/out banding (Figure 5). Mature specimens in the bay measure 45-50 mm in height

Babelomurex oldroydi (Oldroyd, 1929) formally *Latiaxis* (Figures 5a & 5b). The species is not uncommon at various off-shore islands. I have collected two individuals on the south side of the MB channel, both were associated with patches of stone coral at a depths of 15-20 ft. What made the specimen unique is the exceptional condition of a shell that was encased in a mass of red bryozoans. I saw the mass of red, but moved on with my sampling. After perhaps 30 ft, I went back to investigate what I had seen. Turning the mass over I recognized the aperture, but no other portion of the shell was visible. The bryozoan was easily removed, and it was clear that the encrusting material had protected every spine from damage. The shell is of average size, 40.5 mm. In our area, the species can be periodically common off-shore, but they tend to be so encrusted with hard brown hydrozoan, that is impossible to clean. Most specimens do not have spines, but rather a prominent redial ridge.

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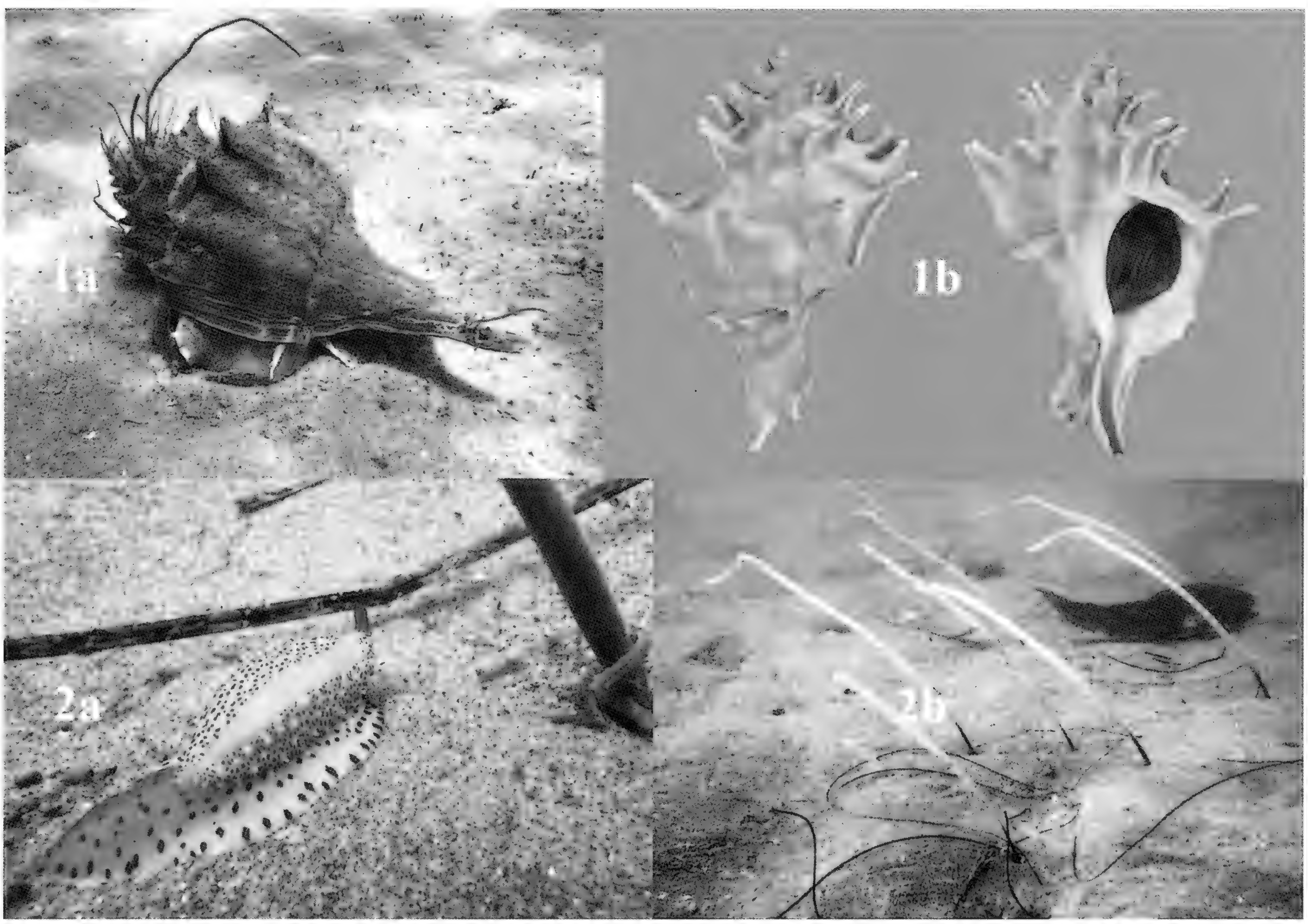
These and other species found in Mission Bay speaks to the overall water quality and conditions in the bay. Obviously, it requires a great deal of time underwater in order to have a chance encounter with uncommon species, or outstanding examples of common species.

Diving in Mission Bay. Whether you are free diving or SCUBA diving, boat traffic is a major concern. I dive during week days vs the weekends to avoid novice boaters. Diving adjacent to the rocks along the channel is generally safe and does not require a dive flag. When you ascend, follow the couture of the rock so you surface near the jetty, always use a compass. If you are diving in the sand flats towards the dredged channel, again, always have a compass and return to the rocky channel margin before surfacing. If you surface a notable distance from the rock lining the channel, you may be warned, ticketed, or worse, meet a boat. If free diving, never dive the pillars under the enclosed bridge bumpers as there is no way to reach the surface. Study sites in the channel required a float, dive flag, and permission from the Life Guard Service, plus notification before diving with a projected entry and exit time. Do not attach the line to the float and dive flag to your gear, attach it to a weight that you can carry and drop.



Figures 1-2. **1a**. Mature *Forreria belcheri* on a clam. **1b**. *F. belcheri* in nearly perfect condition and of moderate size (131 mm). **2a**. *Neosemnia barbarensis* approaching the base of a sea pen. **2b**. Sea pen density where *N. barbarensis* may be found in the bay.

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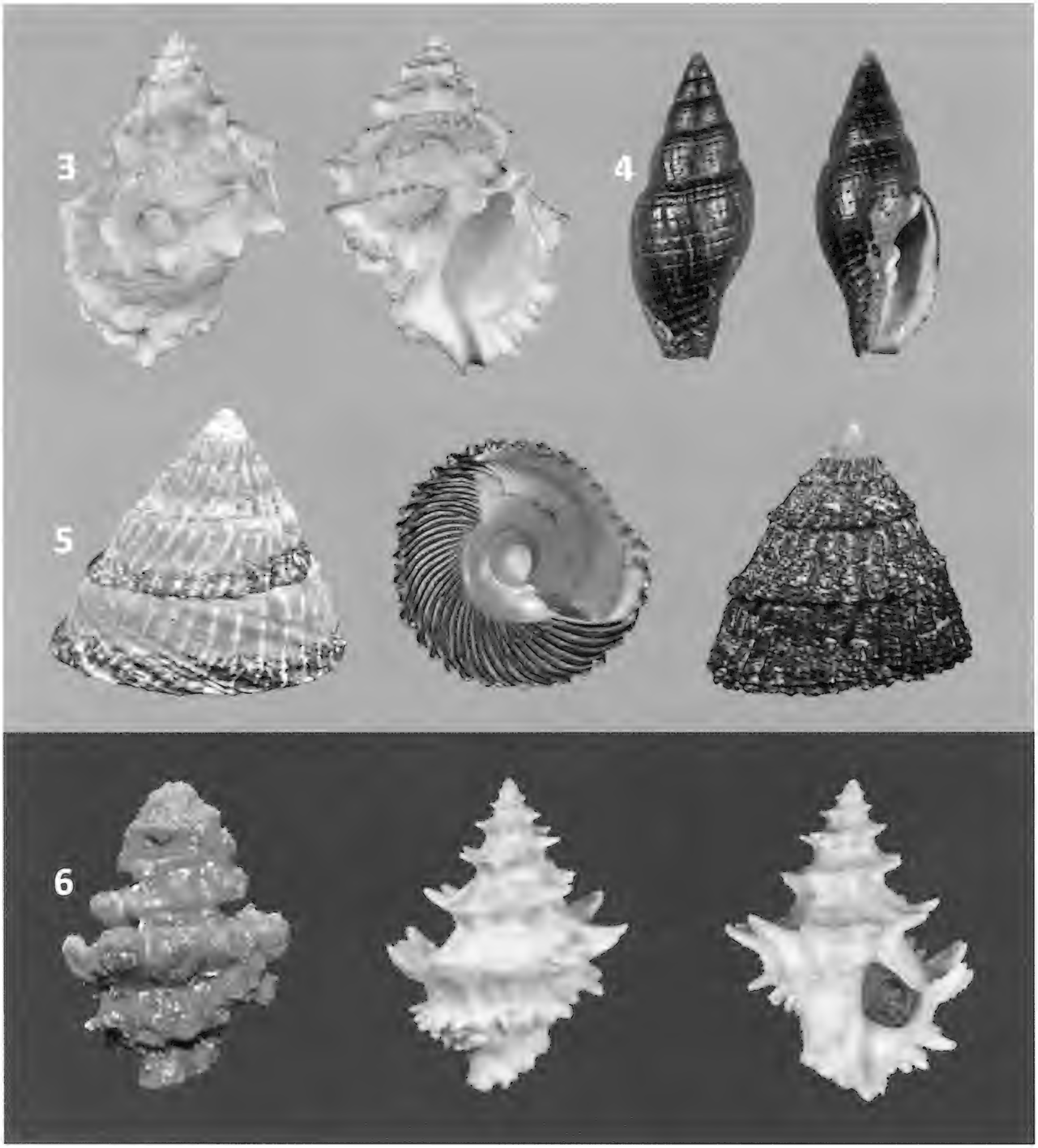

Figures 3-6. **3.** *Crossata californica.* **4**. *Neotiara fultoni.* **5**. *Tegula regina*, the most prevalent color forms in Mission Bay. **6.** *Babelomurex oldroyd,* far left is the appearance of the shell when found, and the same shell after cleaning.

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The "Midas touch" - The Golden Cowrie Registry

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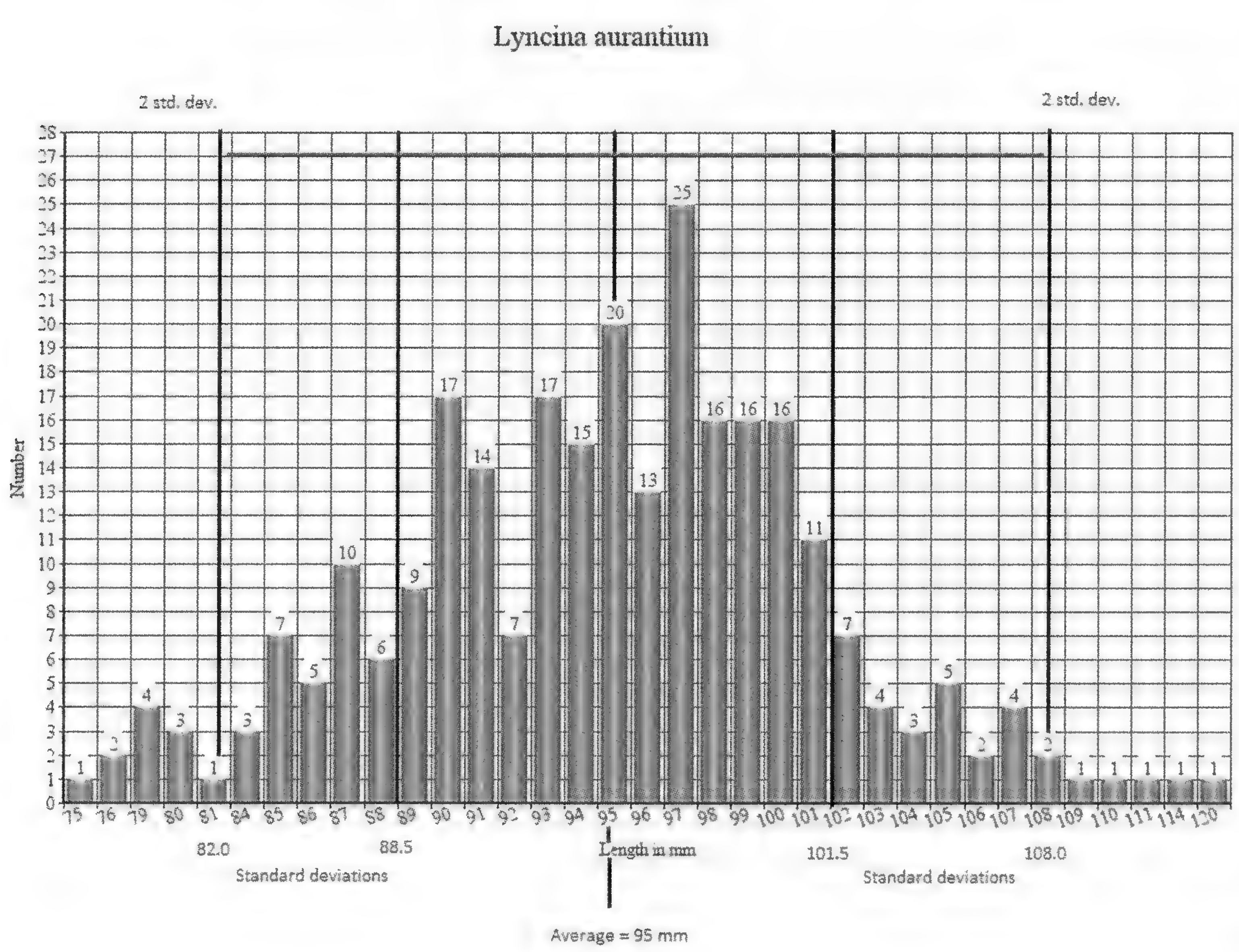
Once upon a time the "Golden cowrie", *Lyncina aurantium* (Gmelin, 1791), was one of the rarest and most sought after shells in the world and was highly coveted by collectors. The story of this shell, and a few other classic rarities, shows why we collect shells for their beauty rather than as a financial investment.

Back in the 1950s and 1960s owning a Golden cowrie was what often distinguished a really nice shell collection from a great shell collection. The Hawaiian Shell Club kept and maintained a detailed list, known a "the Golden Cowrie Registry" associated with the Bernice P. Bishop Malacology Museum in Oahu, Hawaii. Every known specimen of *Lyncina aurantium* was placed on that list, together with the collecting locality data, length, and owner's name. From October 1962 to August 1965, the Hawaiian Shell News published the raw data from "the Golden Cowrie Registry." This was long before the species' habitat was found in the Philippines, and before many hundreds of new specimens were made available to "average" collectors. Today this species no longer commands prices in the thousands of dollar range and a nice specimen can be obtained for $30 to $50.

I obtained one of these older specimens at a San Diego Shell Club auction years ago; it was faded and had chipped terminal ends so no one wanted it. I ended up paying $2 for the shell at the silent auction. This led me to researching "the Golden Cowrie Registry" and preparing a bar graph of the shell lengths so see what the average shell size was "back in the day" when one had to have the proverbial Midas touch to find one, or pay a king's ransom to buy one. A graph and photo are below.



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Laura E. Burghardt (1933-2022)

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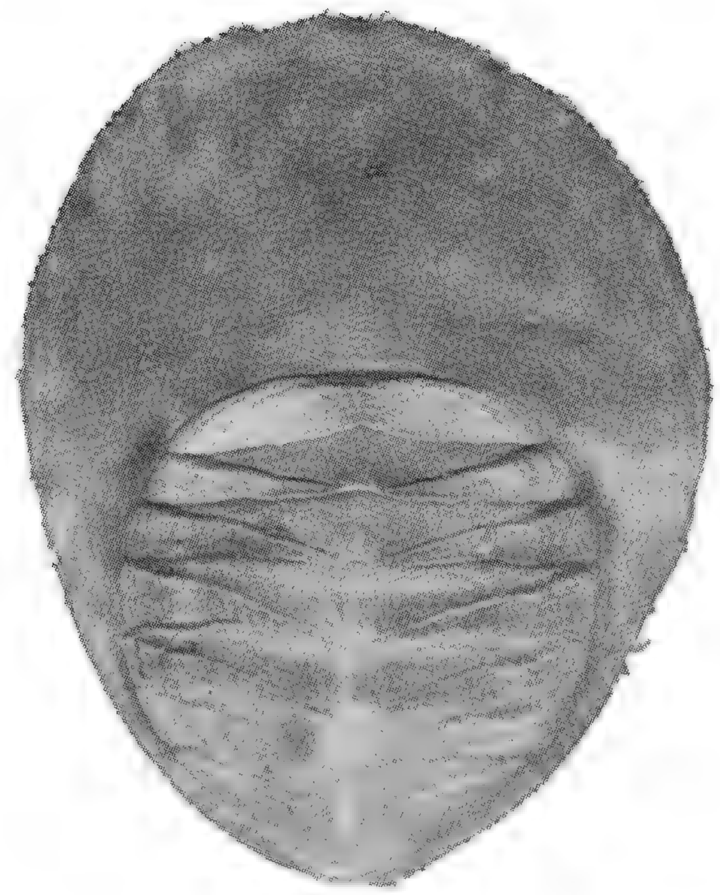
It is with great sadness that I report the passing of another great shelling icon, Mrs. Laura Elizabeth Burghardt, the first lady of chitons! Laura was born and raised in Oakland, California, where she attended Fremont High School, where she met her future husband Glenn Edward Burghardt. Laura and Glenn were married on July 7, 1963. Always a nature lover, sometime in the early 1960's Laura (and Glenn) began collecting shells. It was at this time that Laura became fascinated with chitons, and began earnestly collecting and studying these animals. In 1969 along with Glenn, she wrote the wonderful book "West Coast Chitons". This classic book which illustrates the amazing color and diversity of western North America's fantastic chiton fauna, has been an inspiration to several generations of chiton collectors and researchers!

Laura was a wonderful person and a dear friend! She will be deeply missed! Laura is survived by Glenn Burghardt (husband), Michael Burghardt (son), Patricia Ordway (daughter), Kathleen Burghardt-Cobb (daughter), Glen Cobb (son-in-law), grandchildren: Stefanie Tolleson, TJ Tolleson (grandson-in-law), Karilyn Ward, Josh Ward (grandson-in-law), Jeffrey Burghardt, Chad Burghardt, Toni Burghardt (granddaughter-in-law), Ryan Burghardt, Jon Aether, and Mitchell Cobb. Great grandchildren: Kaili Ward, Jorianna Tolleson, Joanne Tolleson, Logan Burghardt and Clark Burghardt.

Laura has been honored with two species of chitons named for her:
Acanthochitona burghartae Clark 2000
Placiphorella laurae Clark, 2019

Acanthochitona burghartae Clark 2000



Placiphorella laurae Clark, 2019

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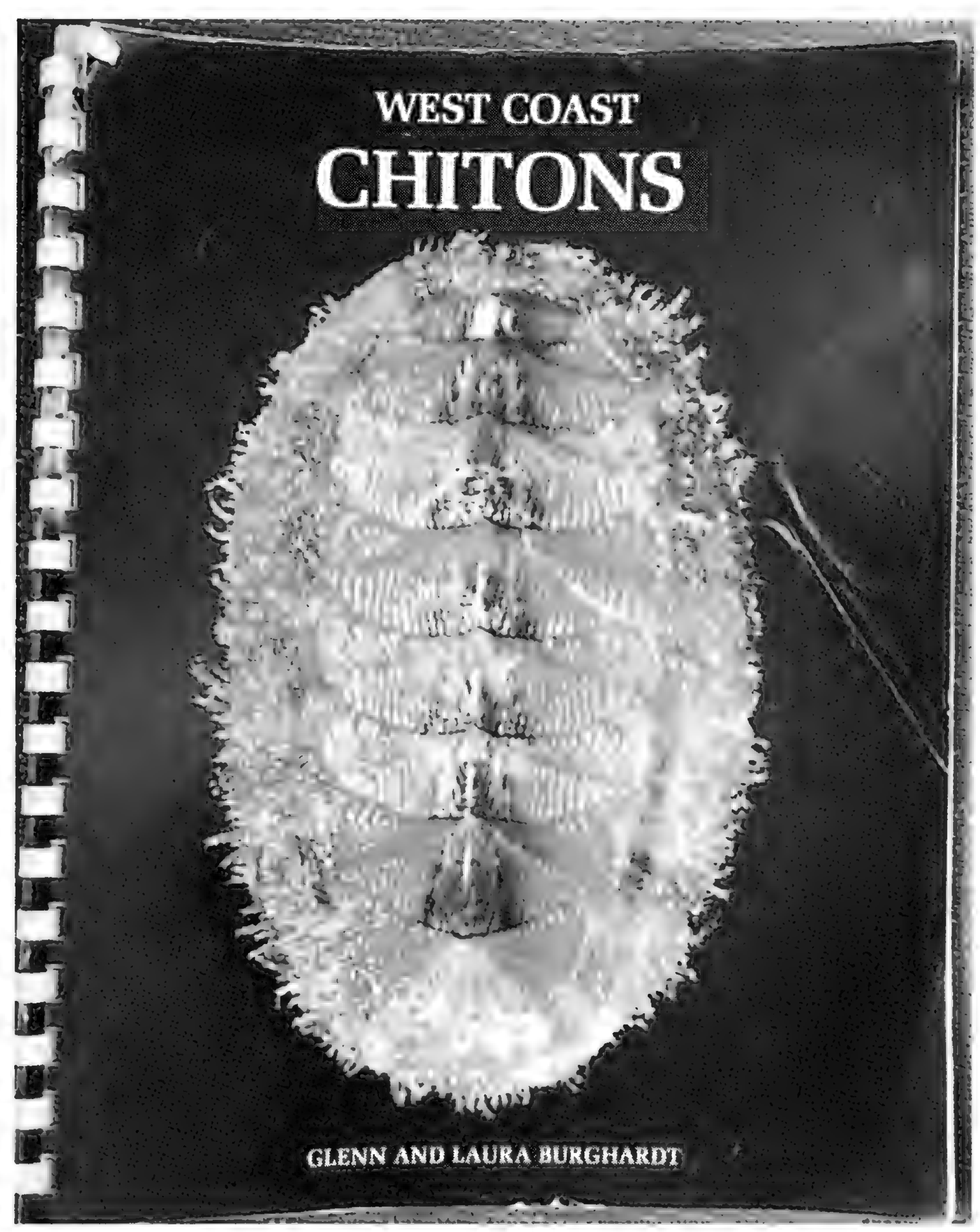

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Everett Long (1944-2022)

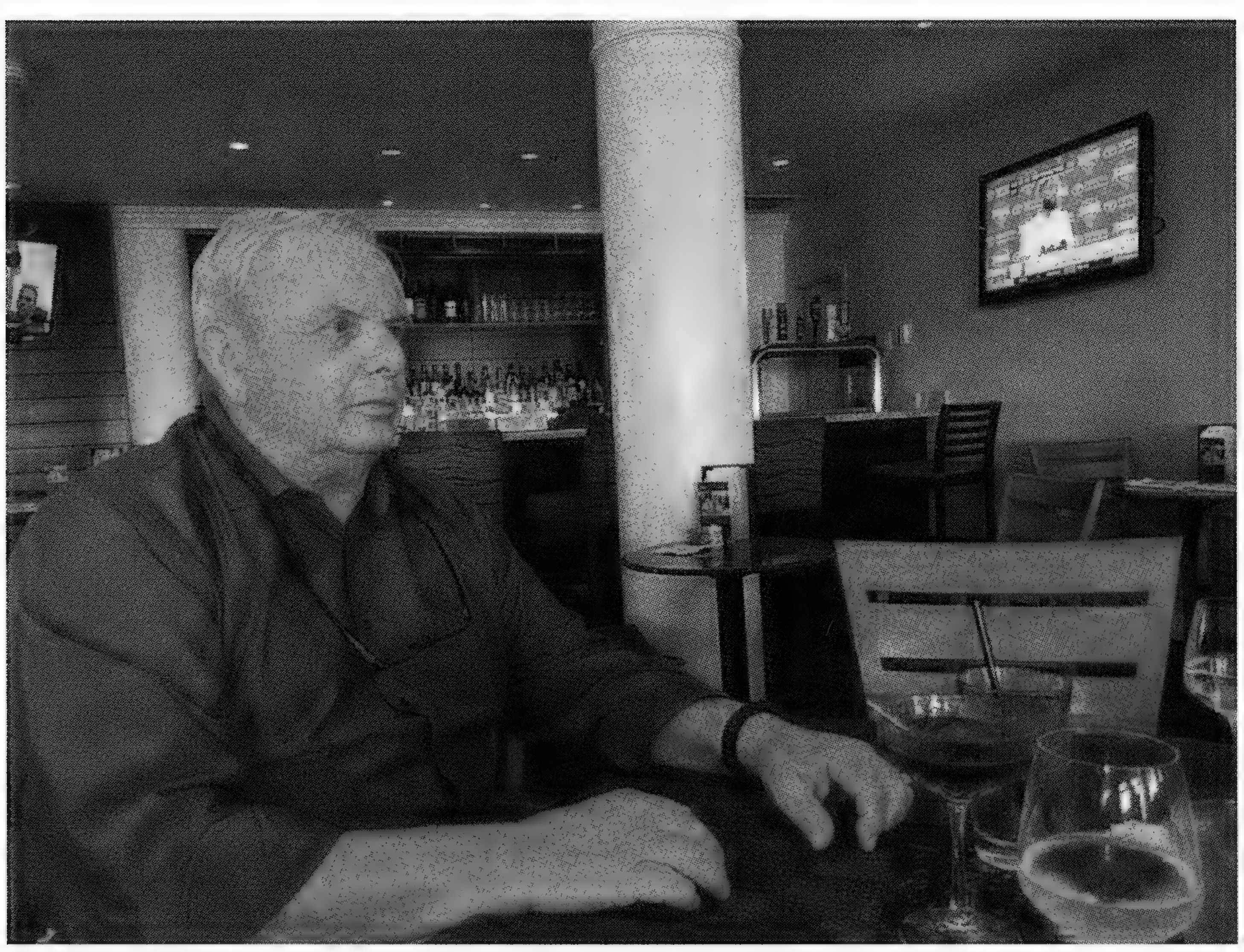
Karlynn Morgan and Mark Johnson

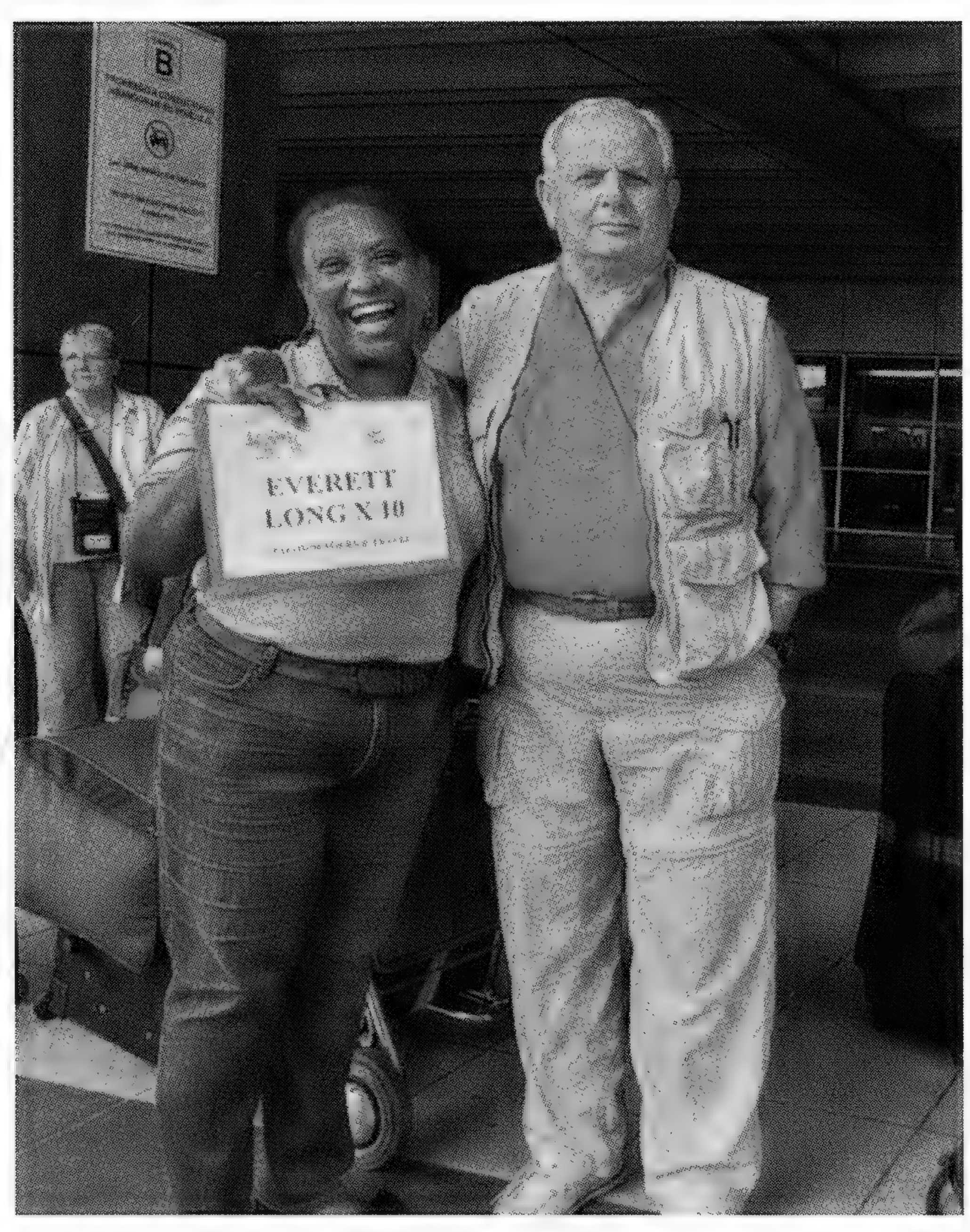
Everett served his country in the USMC and retired at the rank of Lt. Col. He served in Vietnam and was the commanding officer of MWCS-28 and of 7th Communications Battalion. In later years he enjoyed traveling the world collecting seashells

He was an outgoing energetic man, loved by all, and a leading force behind the North Carolina Shell Club. Everett helped Ocracoke Island Community Library replenish its shelves in 2020 after severe flooding from Hurricane Dorian in September 2019. He enjoyed trips to Ocracoke and after Dorian, and wrote a tribute to the island. At the time of his death, Everett was the President of the North Carolina Shell Club and the Vice-president of the Conchologist of America. Everett was an outstanding leader, a fearless warrior, a tireless adventurer and a loving friend.

In addition to his wife, he is survived by daughters, Allison Gale (Tom) of Wilmington and Krista Jones (Taylor) of Winnabow; grandchildren, Laura, Finley, Christian and Riley. A funeral service will be held at 2 p.m. Tuesday, May 3, in the chapel of Jones Funeral Home, 407 Old Hammocks Beach Rd., Swansboro.

In lieu of flowers memorials may be made to North Carolina Shell Club Scholarship Fund (Karlynn Morgan, North Carolina Shell Club, 3098 Shannon Drive, Winston-Salem, NC 27106) or to the charity of one's choice.





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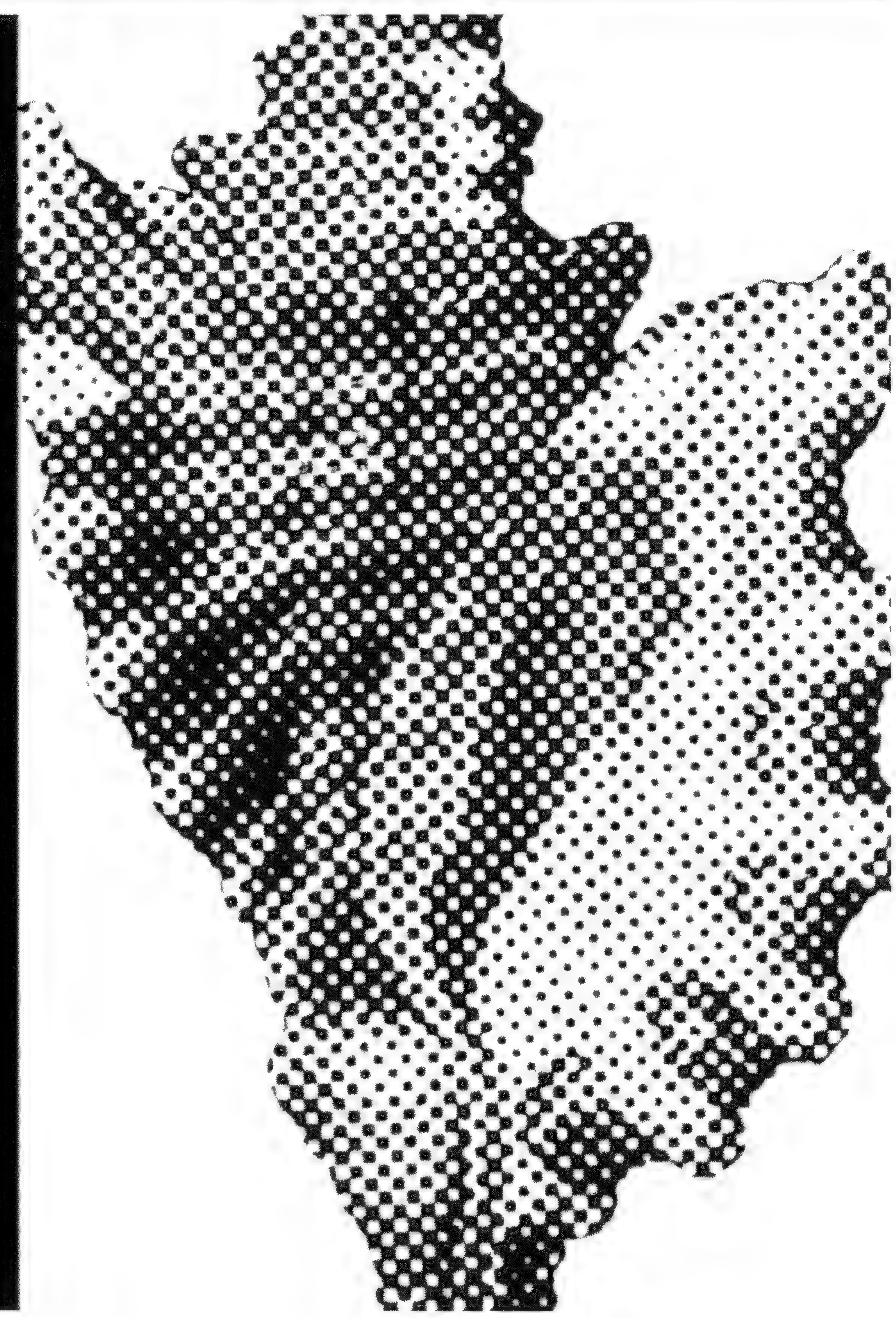

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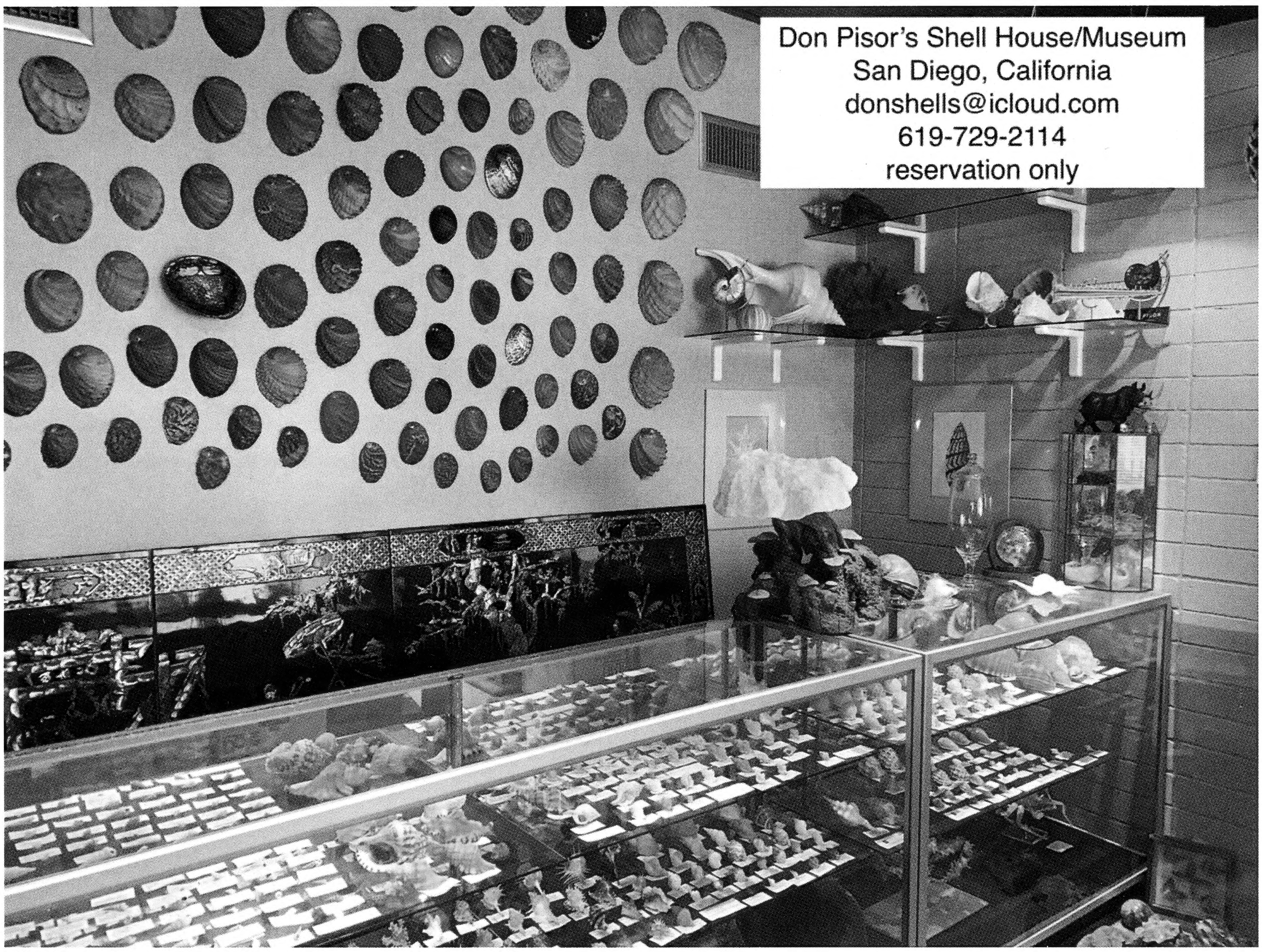

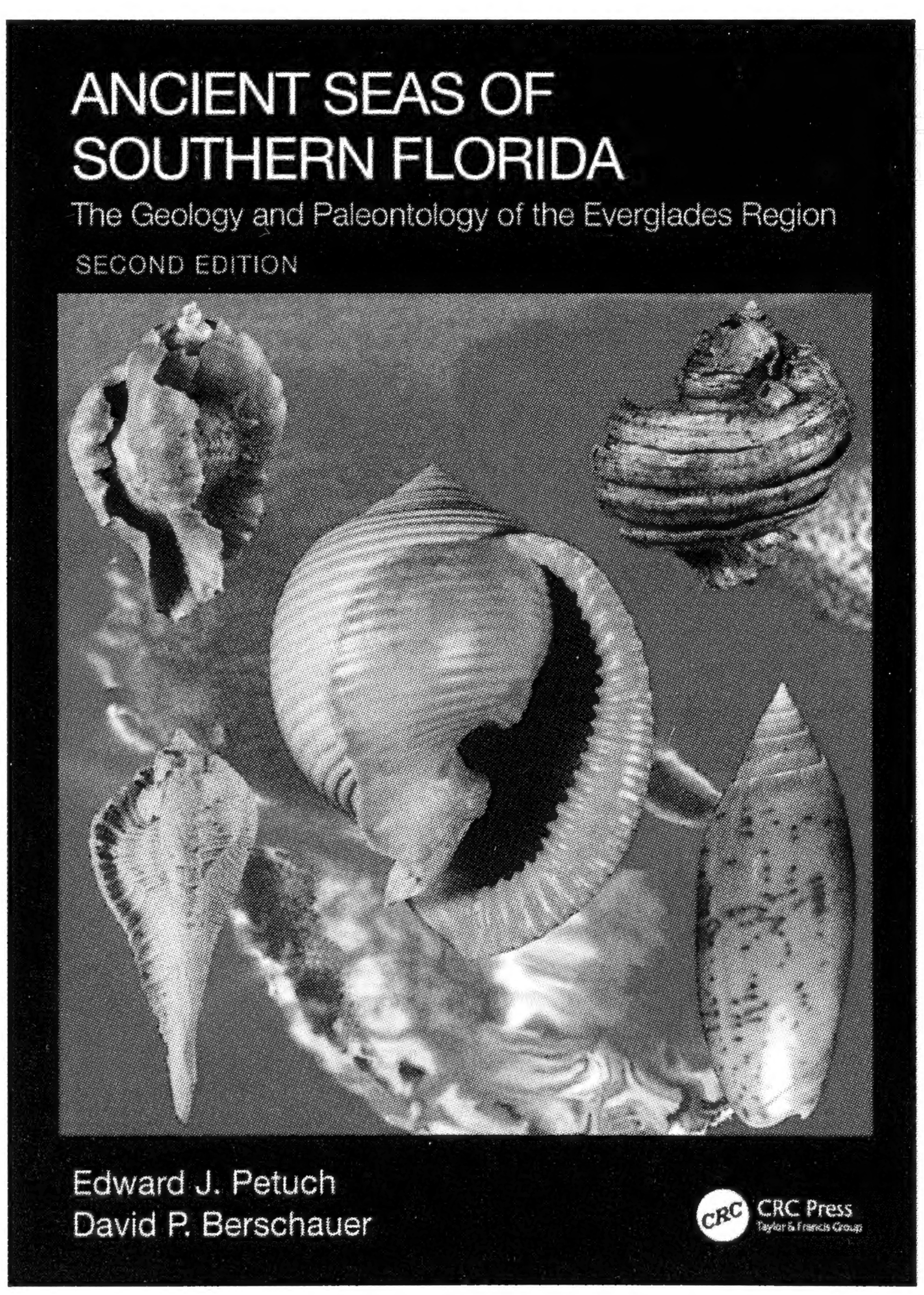

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Back cover: Strombid images from *Ministrombus* and *Doxander* articles in this issue. Top left – *Ministrombus aurantius* nov. sp., Kangean Islands, Indonesia; Top centre – *Ministrombus variabilis* (Swainson, 1820), Nocnocan Island, Philippines;T op centre – *Ministrombus oceanicus* nov. sp., Kwajalein, Marshall Islands; Middle left – *Ministrombus athenius* (Duclos, 1844), Trunk Reef, Queensland; Middle centre - *Ministrombus minimus* (Linné, 1771) Vanuatu; Middle right – *Ministrombus caledonicus* nov. sp., Arama, New Caledonia; Lower left – *Doxander vittatus* (Linné, 1758), Sumbawa Island, Indonesia; Lower right – *Doxander queenslandicus* n. sp., Dingo Beach, Queensland. (Photos courtest of Stephen Maxwell) (Cover artistic credit: Rex Stilwill).